JANUARY, 1943

ELECTRICAL SOUTH

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55th SEASON

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HUNTER, who has made fans and ventilators exclusively during 55 years, is now operating under War Production Board restrictions. • No more fans will be made except for the Army, Navy and Maritime Commission. • HUNTER unfilled orders now on hand represent contracts with Government Agencies. • Additional supplies of certain types can be made available for Government hospitals and Army and Navy projects.

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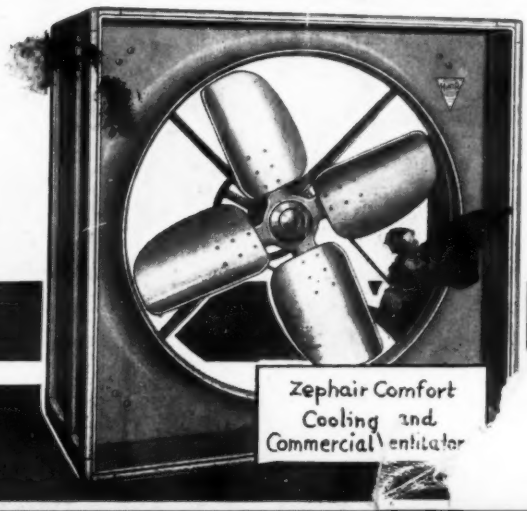

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...r territory are plants doing ...t war work. It is just the concentration ...duction and top ...hem are doing

A survey by you would find the plants handicapped by inadequate lighting. You can show them how industrial accidents lurk in shadows, how glare multiplies rejects.

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...ing equipment can be secured when it can ...n. Better lighting, scientifically applied, ...herefore, it is relatively easy to replace ...wish, our representative will gladly ...g. Write Department ES-1

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"BUY U. S. WAR BONDS... Every Payday All Hazard F

This is a composite photograph of many members of the "Bomber Building" army who individually helped save 100,000 man-hours or more in America's war factories.

Here's the Latest News about the "BOMBER BUILDERS"

HELPING with all their might to speed war production through better lighting, 2907 lighting men in all parts of the country have signed the pledge reproduced on the opposite page. Every day this army grows stronger as new names are added.

Already these 2907 men, recruited from the staffs of electric service companies, electrical jobbers, ·tractors and manufacturers of lighting equip- well as from General Electric's own ·s, are credited with adding over ·ours annually to America's war

·vn as "Bomber Builders", ·er lapel button upon signing the pledge. And each of them has as his goal the winning of the Gold Bomber pin, which is awarded to every man who "builds a bomber", that is, every man who helps save 100,000 man-hours in war factories through lighting improvements. As of December 7, a total of 139 "Bomber Builders" had won the right to wear the Gold Bomber pin. And many others are well on their way toward that goal.

The lighting industry has a right to be proud of these men—all of them. General Electric is glad to publish this tribute to these Wartime Lighting Counsellors who have pledged their time and effort toward one goal —"using light to help win the war."

G-E MAZDA LAMPS

HERE'S THE HONOR ROLL OF "BOMBER BUILDERS"...DECEMBER 7, 1942

EACH OF THESE MEN HAS HELPED SAVE OVER 100,000 MAN-HOURS OR MORE:

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J. M. ASHER, Benjamin Electric Manufacturing, Philadelphia
WM. J. ASHTON, Pacific Div., G-E
H. ATKINSON, Graybar Electric, Houston
F. K. BAILEY, Muntz & Lea, Chicago
R. H. BAKER, Mill Power Supply, Charlotte, N. C.
A. G. BIRD, Graybar Electric, Lansing
L. J. BISCHOF, Atlantic Division, G-E
J. G. BLOOD, G. E. Supply, Buffalo
E. G. BRADLEY, Madison Electric, Detroit
LYN BRIGHT, Elliott-Lewis Electric, Philadelphia
J. W. BROWN, Atlantic Division, G-E
E. A. BUEL, Continental Division, G-E
JOHN T. BURDICK, Madison Electric, Detroit
J. A. BUREL, Matthews Electric Supply, Birmingham
W. WALLACE BURKE, Public Service Co. of N. H., Manchester
R. P. BUSCH, Empire Division, G-E
L. J. CAMPBELL, Southeastern Div., G-E
JOHN R. CANNING, Elliott-Lewis Electric, Philadelphia
J. W. CARPENTER, Elliott-Lewis Electric Philadelphia
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GOMER F. DAVIS, Buckeye Div., G-E
C. J. DETMERS, Madison Electric, Detroit
E. F. DIBELIUS, Atlantic Division, G-E
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FRANK C. FLETCHER, Graybar Electric, Minneapolis
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C. K. FULLERTON, Madison Electric, Detroit
E. E. FOURNIER, G. E. Supply, Springfield, Mass.
HENRY GALLIEN, JR., New York Power & Light, Troy, N. Y.
R. D. GLENNIE, G. E. Supply Corp., Buffalo
E. G. GOLDSMITH, Empire Div., G-E
M. W. GORDON, New York Power & Light, Troy, N. Y.
K. A. GOTTSCHALK, Cleveland Electric Illuminating Co., Cleveland
L. M. GRAWEMEYER, The Miller Co., Ardmore, Pa.
H. R. GREENE, Daybrite Ltg. Inc., Cleveland
G. L. GRUENWALD G. E. Supply, Wichita, Kansas
DUPONT GUERRY, Huntington & Guerry, Greenville, S. C.
JAMES E. HAMILL, Atlantic Div., G-E
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E. J. PERKINS, Holophane Co., Boston
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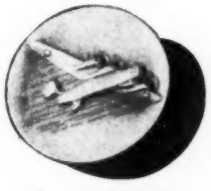


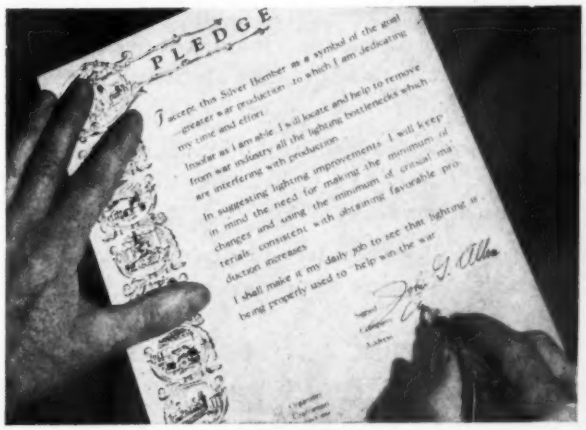
SILVER BOMBER LAPEL BUTTON

GOLD BOMBER PIN

Of the 2907 lighting men who had signed the pledge at the right by December 7, 1942, the 139 men listed above have already helped save 100,000 man-hours or more and are wearing the Gold Bomber pin. In addition to these, lighting men in all sections are fast approaching that goal.

* * *

THIS IS THE PLEDGE that 2907 lighting men have signed indicating their determination to help war plants speed production with better lighting.



GENERAL ELECTRIC

Tomorrow may be too late—do it NOW

THIS

MIGHT HAVE PREVENTED

THIS

WARTIME restrictions make copper products hard to get — this includes electrical wire and cable. It will pay you to protect what you have.

Anaconda's Preventive Maintenance Plan will help you check to see that cables in your plant are not being abused.

If you follow this free plan you not only help yourself, but more important, you help the war effort. This manual provides a practical automatic method for complete analysis of circuits and equipment... uncovers potential weaknesses ... methods for correcting them... with charts to enable quick periodic check-ups.

NOTE: Through this Preventive Maintenance Plan you may uncover the evidence necessary to obtain an "emergency repair priority." This is explained fully in the plan book.

43225

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

Anaconda Wire & Cable Company
25 Broadway, New York City

Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding production.

Individual .....

Company .....

Address ..... City .....

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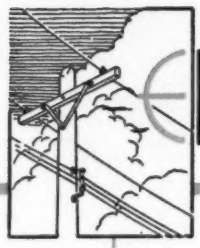
JANUARY
1943

Volume 23 No. 1



ELECTRICAL SOUTH

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Manager

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Investigate this Modern Method of Electrical Distribution. Let the (FA) Sales-Engineer show you how it may be applied to advantage — whether in new construction or plant modernization. His long experience will be helpful — and he will be glad to consult with you — without obligation. Write for his name and address.

Let Us Send You Bulletin 65

which gives full details of (FA) Busduct installations, with photographs, diagrams, prices and suggested specifications . . . Frank Adam Electric Co., St. Louis, Mo.

(On special order, "Conservation Type" (FA) Busduct, using a minimum of critical copper and steel, to meet W. P. B. requirements, is available.)

Main power breaker, 1,000 Amp. Plugin (FA) Busduct and (FA) Plugin Units, with service Feeder (FA) Busduct entering at right of breaker cabinet.

Part of a "loop" system of Plugin (FA) Busduct feeding a battery of automatic screw machines. Low headroom required duct to be mounted against ceiling.

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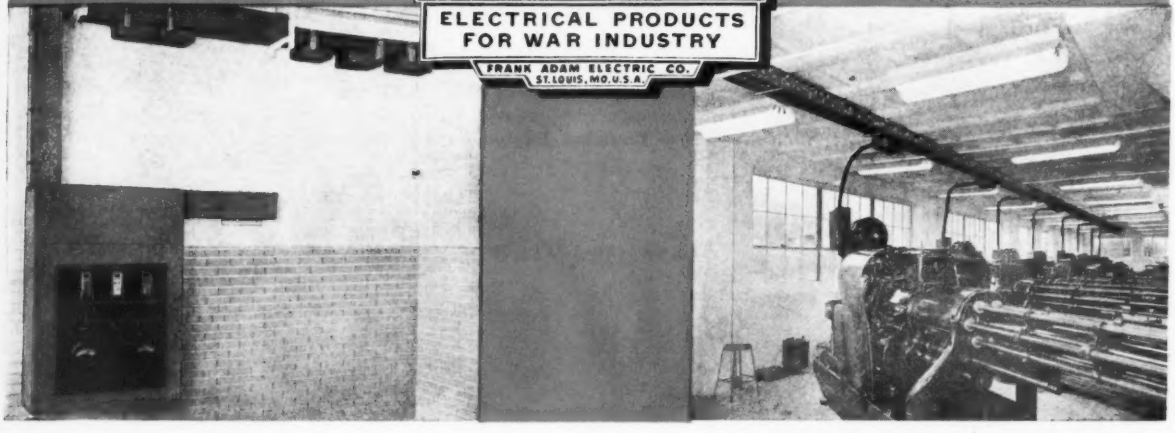


ELECTRICAL SOUTH

JANUARY, 1943

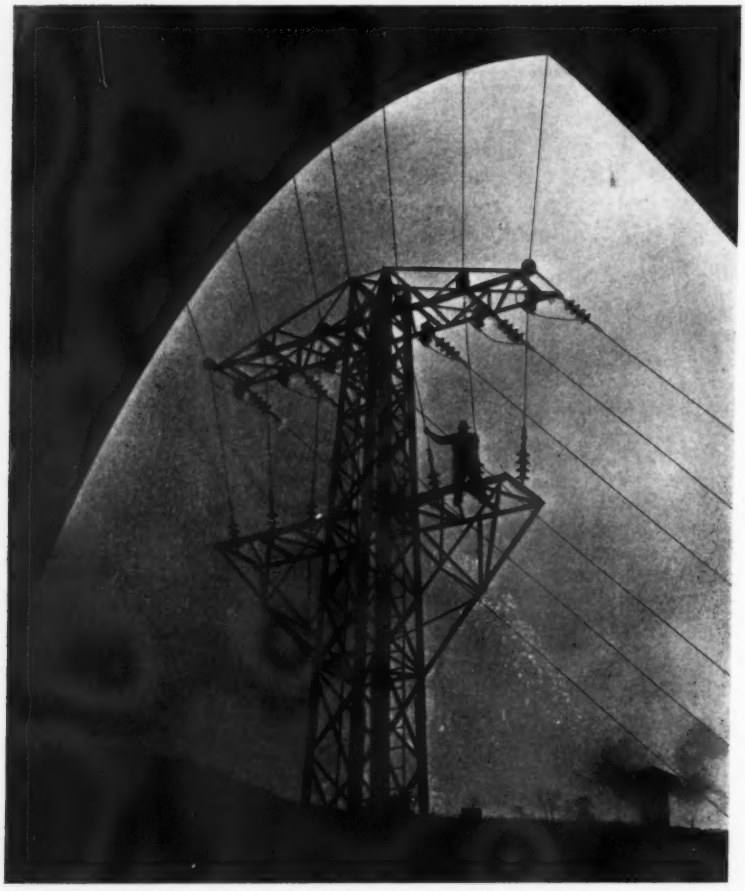
The Power Industry in 1942

Proves equal to war demands; increases generating capacity by 2,720,000 kilowatts net, with higher margin above peaks in comparison with last year; 1943 outlook indicates ample capacity in all areas.

THE STABILITY and resourcefulness of the electric light and power industry is again being demonstrated by the present war emergency. All demands for electricity for the munitions and armament of the armed forces have been successfully met in every section of the nation; the requirements for civilian use have been covered without resort to curtailment or rationing and the margin of reserves for the country as a whole has been increased substantially over last year's levels.

Along with the progressive construction of new munitions plants the conversion of existing facilities has freed for the production of war materials much of the load which was formerly devoted to peacetime and civilian uses. Largely as a result of these characteristics of the war effort, utility sales of industrial power increased only 16 per cent in 1942 notwithstanding the enormous increases in war expenditures of 377% during the same period and the corresponding increase in the production of munitions. Industrial power sales rose from 76,000,000,000 kilowatthours in 1941 to 88,000,000,000 in 1942. In spite of this rise in industrial power sales, this class represented but 56 per cent of the utilities' total sales as compared with 54 per cent a year ago.

At the same time, and in the face of dim-outs, daylight saving and other factors, the other uses



This year-end statement on the power industry was released by C. W. Kellogg, president of the Edison Electric Institute, a national association of electric utility companies.

●

of electricity have shown an only slightly less vigorous growth from 64 billion kilowatthours in 1941 to an estimated total of 71 billions in 1942 an increase of 7 billion kilowatthours, or 11 per cent.

As far as the year 1942 is concerned, the long time trends prevailing in the electric light and power industry persisted with but little change. In spite of the shutting down of many small business and commercial establishments, a net gain of over 600,000 customers was recorded during the year; the relatively small slowing down of sales of electricity for business use was largely offset by the demands of government for housing and similar purposes, and the use of electricity by the residential household consumer continued to reach new high levels.

With the controllable operating expenses heavily pared by the elimination of peace-time functions no longer necessary in a war economy, much of the additional expense of carrying on a larger volume of business has been offset, and earnings before taxes have, in the main, been satisfactory. Federal taxes, however, have more than siphoned off all the gains in operating net earnings as fast as they have appeared.

New Generating Capacity

Approximately 2,290,000 kilowatts of new generating capacity were added to the public utility power houses during 1942 and some 200,000 kilowatts were retired, leaving a net increase of 2,720,000 kilowatts for the year and bringing the grand total of generating capacity to approximately 47,000,000 kw. This compares with a net increase of 2,450,000 in 1941 and, except for the boom year of 1925, represents the largest annual increase in generating plant in the history of the industry. After deducting equipment retired from service or reduced in capacity rating, the net gain in steam generating equipment was 1,655,000 kilowatts, in hydro electric plants 1,011,000 and in internal combustion engines 54,000 kilowatts.

Electric utility companies added 1,600,000 kilowatts of net capacity. Federal Government and district projects added, 1,045,000 and municipal systems added 75,000 kilowatts.

In line with the recently announced policy of the federal government to restrict all types of construction to enterprises capable of early completion, about 2,800,000 kilowatts of prospective power installations were ordered cancelled by the WPB in 1942. The bulk of this cut affects generating equipment scheduled for 1944 and 1945.

The total net increase in generating capacity scheduled for 1943 is 3,384,000 kilowatts, with 521,000 for 1944 and 195,000 for 1945, making a total during the next three years of 4,000,000 kilowatts.

Margin of Reserves Increased

The sum of the noncoincident peak loads at the generating stations for December 1942, for all stations contributing to the public supply, is estimated to have been 37,000,000 kilowatts. This is about 5 per cent above the figure for last year and is 10,000,000 kilowatts below the total installed capacity of these generating stations. The same margin last December was 9,000,000 kilowatts, so that the margin of reserve capacity was increased during the year by 1,000,000 kilowatts.

For the group of larger (or so-called Class I utilities) reporting to the Institute, the sum of the noncoincident peak loads for December is estimated to have been 33,000,000 kw as compared with approximately 31,500,000 kw in 1941. This figure of 33,000,000 kw for these larger systems is 8 per cent below the estimates made by them a year ago, and is nearly 20 per cent below the forecast of the Federal Power Commission of a year and half ago. Daylight saving time introduced in February of this year affected these earlier estimates by about a mil-

(Continued on page 55)

Some Pointers on Maintenance In the Industrial Plant

By Fred D. Mosher

THE OBJECTIVES of good maintenance are a plan which will provide care and upkeep for the apparatus so that it will perform the job for which it is intended with a minimum of outages, and a method of execution of the plan which fits in properly with operation and other functions. It is essential that vigilance be exercised in making inspections, maintaining equipment, and completing the repairs required.

Equipment Catalogs

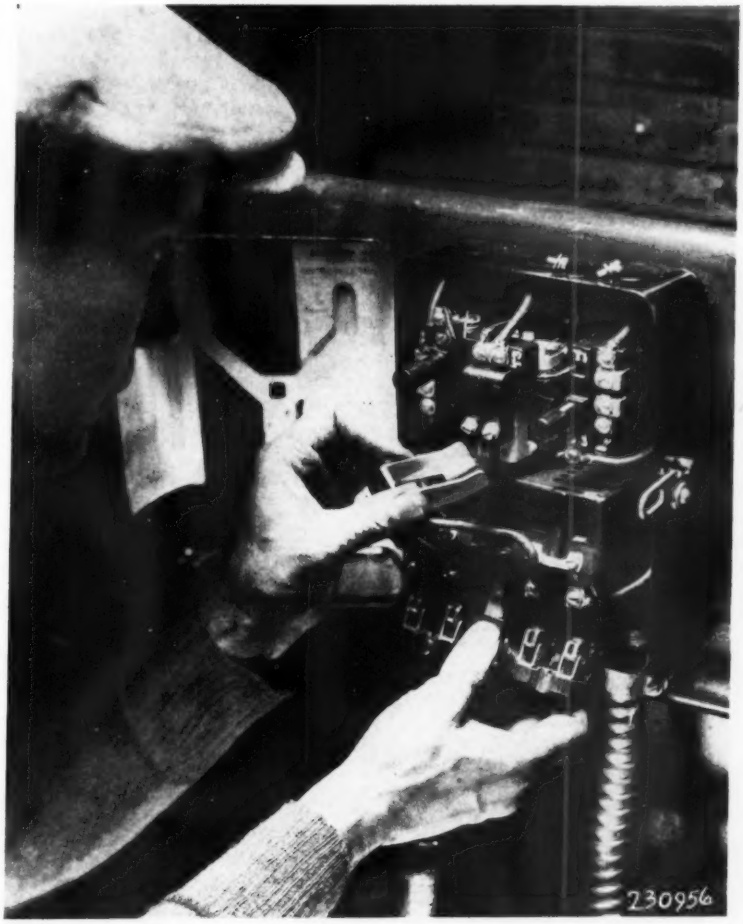
Each piece of equipment when delivered from the manufacturer has an initial history. In many cases, a motor, for example, may carry with it a simple card stating that the serial number is so and so, and the rating, etc., are such and such; a connection diagram may be included, particularly when the motor is designed for dual voltage. Such data should be provided for all motors. In reporting trouble to the builder, in ordering spare parts, and in seeking advice, the data should always be quoted. Added to this necessary data should be the user's history of the equipment.

The user should record the location of each motor, the date of installation, any re-locating done after installation, any change in application, major changes and repairs to the apparatus; this part of the history will grow and this is as it should be. Manufacturers highly recommend this idea of cataloging equipment, and many of them provide forms or cards for these records.

Apart from the usefulness of the records in maintenance work, the records facilitate inventory, layout changes, and plant expansions. The details of filing records of equipment should be determined by the nature of the plant as to size, type of service, and other influences; in all cases, the records should be easily accessible to those concerned with maintenance.

In these times when maintenance must be viewed in the light of conditions which make major replacements almost impossible, it is important that the facilities for care and maintenance be given considerable attention. Electrical maintenance is the work of specialists, and it should never be lumped in with a jumble of other work. It is better to have one person charged with the job at full capacity than to have a number of persons devoting part time to the activity.

The physical setup such as storage space, repair space, and testing equipment should always be separated from other activities. Numerous companies have made it a practice for years to keep maintenance personnel up to date on repair methods by arranging factory training, and with changes in personnel being made rapidly, this method of getting first hand information should not be neglected. It is both in the interests of the user and manufacturer to have equipment kept



Regular inspection of linestarters reduce maintenance cost. Modern control units are designed for speedy inspection and replacement of parts—for example, the armature of this motor starter can be removed without loosening any wire or dismantling any other parts. (Westinghouse Photo)

in good operating condition. In every case the responsibility for inspections, routine maintenance, and general condition of electrical apparatus should be vested in one person.

Inspections

Three things are essential for worth-while inspections. First, the inspections, once the time element has been decided upon, must be made with regularity. Each inspection should be accompanied by minor tests which will show up defects not apparent by sight, feeling or hearing. And lastly, a report of each inspection should be made so that a quick review of the report will tell whether the motor or apparatus needs further attention to prevent future trouble.

The time which should elapse between inspections will depend on the kind of service and location of the motor; the minimum should be once a week. At the weekly inspection, rotating parts of motors, such as commutators, should be examined for sparking and dirt; the condition of the brushes should be noted; the oil levels in bearings and the condition of oiling rings should be observed as well as the condition of grease bearings with regard to leakage of lubricant.

It should always be kept in mind that there is only one place around a motor where oil or grease is desired and that is in the bearings; once oil gets oozing around a shaft or deposited on windings and insulation it becomes a deadly enemy.

Where plant changes are being made, it is important to know that new steam lines, overhead ductwork, and material handling will not damage apparatus from moisture, dirt laden air, or falling objects. Where damage of any kind may occur, protection should be provided by coverings or enclosures. At the weekly inspection, if operating conditions permit, each motor should be stopped and restarted so that hearing and seeing will point out unusual conditions. Starters, contactors, and other controls should be observed for arcing.

In addition to covering the points of the weekly inspection, electrical equipment should get a half-year inspection. The semi-annual examination should be made when the motor may be stopped for inspection of brush pressures, mechanical parts such as clamping rings, holding end-shield bolts, pulleys, couplings, set-screws and keys. The extent of dust and dirt accumulations on windings, poles, and coils should be noted. Connections in control boxes should be examined semi-annually; guards, belts, chains, and gears should be examined for wear or defects. The current input of the motor should also be checked.

At the end of each year, an inspection should be made to cover all items inspected at the weekly and semi-annual examinations. In addition, air gaps should be checked, insulation should be tested with a megohmmeter, clearances of sleeve bearings should be checked, and commutator and armature coils should get a thorough examination.

Preferably at the end of three years, and not more than every five-year period, a motor should get a dismantled inspection. The armature should be exposed by removal, and a re-conditioning overhaul should be given to each unit.

Maintenance Procedure

Good maintenance practice dictates that routine work such as cleaning, greasing, and oiling be done regularly. One of the reasons for inspection is to determine the necessity for maintenance work and repairs. Regular cleaning cannot be stressed too much. Particles of dust, droplets of oil, moisture, and gritty substances get into coils and windings, and ventilation openings where they will cause trouble.

Dirt is an insulator of heat and it prevents surfaces from being cooled; in a motor, when this condition becomes serious, the machine draws abnormal current load and, ultimately, failure may result. Oil should be removed by the use of a non-inflammable solvent such as carbon tetrachloride, using a soft cloth saturated with the cleaner. Heavy deposits may be scraped off, if care is taken not to damage the insulation. For motors in regular service, regular blowing out with low pressure compressed air will be adequate for cleaning. The compressed air should be used at least every six months, the air, of course, being free from moisture and foreign matter.

Motors in severe service, or in

(*Continued on page 60*)

SERVICE RECORD

Date	Building	Floor	Driving	Drive	Tested Hp.

REPAIRS

Date	Condition	Due to	Repaired by	Cost

H.P.	Syn. Speed	Make	Connection Diagram	Application	Shop or Mill No.	Card No.

Type	Frame	Poles	F. L. Speed	Volts	Form	Temp. Rating	F.L. Amp.	Phase	Cycles

Serial No.
Model No.
Publication No.

CONTROL EQUIPMENT

Type Make Pub. No.

BRUSHES
No. Per Motor
Cat. No.
Size
Material
Grade

LININGS
Front End, Cat. No.
Pulley End, Cat. No.

COILS
(Cat. or Spec. No.)
Stator or Field
Main
Comm.
Comp.
Rotor or Armature
Coils
Bars
No. per Set

Connection Diagram

PULLEY
Diam.
Face
Belt Width
Bore
Keyway

Mfr's Order No.
Our Order No.
Date of Order
Cost { Motor / Control

User:
Location:

a) Works

An important asset in any maintenance program is a well-kept set of inspection and maintenance records. The user should record the location of each motor, the date of installation, any relocating done later, changes in application, major repairs, etc. Manufacturers highly recommend this idea of maintenance records and many of them provide forms or cards for this use. Both sides of a typical motor service record card is shown here.

Pricing Machinery Service

Motor rewinding and repair shops and other organizations supplying service for "machinery" must comply with price regulations of OPA. This digest explains the procedure.

THE FOLLOWING digest covers principal points of Maximum Price Regulation No. 136 as Amended (Machines and Parts and Machinery Services) as it applies to suppliers of machinery services. The digest covers only machinery services and is issued for the guidance of the trade in complying with the regulation.

If you supply machinery services, you want to know how Maximum Price Regulation No. 136 as Amended controls the charges you make to your customers; you want to know what reports you are required to file, what records you are required to keep. Here are the essential features of the regulation as it applies to machinery services alone.

Machinery Services Covered

The term "machinery services" means any operations in the process of machining, welding, treating, finishing, testing, inspecting, adjusting, maintaining, repairing or rebuilding of a machine or part owned by another, or of a product owned by another which, as a result of such an operation, becomes a machine or part (Section 1390.1(b) of the regulation).

Maximum Price Regulation No. 136 as Amended went into effect July 22, 1942. Since July 22, you or any other machinery service supplier legally have not been allowed to supply machinery service at prices higher than the maximum price as provided by the regulation.

The date for filing your list prices was August 1, 1942. If you have not already filed with the Office of Price Administration at Washington, D. C., all published or confidential price lists, charge sheets and discount sheets which were in effect in your shop on March 31, 1942, do so at once. An outline of material which reports must contain is given below in the section headed: Reports Required of Suppliers of Machinery Service.

Maximum Prices—List Price Items

The highest rates you are allowed to charge for the services you supply are the rates charged on March 31, 1942.

Where you had no established list price in effect on March 31, 1942, Maximum Price Regulation No. 136 as Amended provides a pricing formula to be used in computing your service charge. In this pricing formula you are to use the price-determining methods in effect March 31, 1942. The main provisions regarding the pricing formula follow:

(1) Over-head or machine-hour rates: To the extent that the pricing method in effect on March 31, 1942, included over-head or machine-hour rates, the machinery service supplier is to use in the pricing formula the over-head or machine-hour rates which were used or would have been used on this date.

(2) Labor rates: To the extent that the service involves labor costs, the machinery service supplier is to use in the pricing formula the labor rates prevailing in his establishment on March 31, 1942, for each classification of labor. Overtime labor cost may be included in the service charge computed by the pricing formula only to the extent that it represents actual out-of-pocket expense. It must be agreed to by the customer and must be billed separately. Of course, if you have already allowed for overtime in your machine-hour rates or over-head, you are not allowed to duplicate your charge.

(3) Material prices: To the extent that you purchase incidental materials for the performance of the machinery service, you may use in the pricing formula the actual price paid for these materials as long as this price is not higher than the applicable maximum price for the particular material employed. In using this pricing formula you are permitted to use the charge that would have been made on March 31, 1942, for the type and form of material currently used and from the source currently used.

Use of the Pricing Formula

The following hypothetical examples serve to illustrate the use of the pricing formula in pricing a machinery service under MPR No. 136 as Amended. There are a multitude of methods of pricing which may be used. The important thing, however, is that the machinery service supplier use the method he used on March 31, 1942, and the rates prevailing in his shop on that date. The names and rates used here are illustrative only; they serve no other purpose.

(1-a) Use of machine-hour rates in computing a charge. Mr. Brown, operator of a machinery service shop, had no published or confidential price lists in effect on March 31, 1942. However, on that date he did employ a machine-hour rate of $3.50 per hour. His machine-hour rate included his full charge for the machinery service. He has received an order for boring a set of cylinders, a job which he estimates will take 20 hours to complete. He prices as follows: 20 hours—machine-hour rate of $3.50 per hour, $70. Here, the price for the job is $70.

(2-a) Computation of machinery service charge by pricing formula. Mr. Apple operates a medium-sized shop supplying machinery services. As he had no published or confidential list prices or machine-hour rate in effect on March 31, 1942, he is required to price his services according to the pricing formula. Mr. Apple does not use a machine-hour rate, but builds up his charges from costs.

On March 31, 1942 (the base date), the following rates were in effect in Mr. Apple's shop: labor rate, $1.00 per hour; over-head rate, 100 per cent of direct labor; and profit, 20 per cent of direct labor plus over-head.

Mr. Apple is asked to estimate a charge for turning a particular set of shafts. He estimates this job will require 30 hours of labor. By using the pricing formula, his computation of the charge is as follows:

30 hours of direct labor at $1.00	$30
Over-head on 30 hrs. of direct labor (100% of direct labor)	30
	$60
Mark-up or profit (20% of direct labor plus over-head)	12
Estimated price of service	$72

(2-b) Inclusion of charges for overtime. The purchaser of the machinery service finds that he must have this order completed several days ahead of the anticipated time. The rush calls for the use of 10 hours of overtime. The following demonstrates a calculation of the charge in accordance with the pricing formula:

20 hours of direct labor (straight time) at $1.00		$20
10 hours of direct labor (overtime)		
Straight time at $1.00 =	$10	
Overtime at .50	5	15
		$35
Over-head on 30 hours of direct labor (100% of direct labor at straight time)		30
Profit of 20% on 30 hours of direct labor at straight time, plus over-head		$12
Price for machinery service		$77

In accordance with MPR No. 136 as Amended, the overtime charge of $5 must be agreed to by the customer and be billed separately.

If you want to increase your charge for a machinery service computed by the pricing formula, or if you wish to increase the charge above the original contract price, a report must be filed with OPA, Washington. (See Section 1390.18(g) of the attached report list.)

If you are required in writing by the Office of Price Administration, or if at any time it is your wish to establish a new list price where no list price existed previously, compute the price by using the pricing formula and file a report with OPA, Washington. The requirements of this report appear in Section 1390.13(b) of the attached report list.

If you are operating a new or converted plant or shop, the charge made for machinery services should be computed by using the pricing formula prescribed above. A converted plant is a plant or shop which has been converted to perform a wholly different machinery service from those performed prior to March 31, 1942. You are required to file a report not later than five days after either quoting, contracting or performing the machinery service at the proposed price (See Section 1390.9(c)(2) in the attached report list for the details required.)

The above constitute the main provisions of Maximum Price Regulation No. 136 as Amended, as it applies to machinery services. However, certain other sections of this regulation are sometimes applicable. These include the following:

Emergency service charges. Where an emergency requires that special service charges involving extra expense be provided, you may charge for such services if you bill them separately. These charges, of course, must not exceed out-of-pocket expense incurred by such special service.

Federal and state taxes. You are permitted to pass on any tax on a machinery service which was passed on March 31, 1942. Taxes levied since that date on any machinery service may not be included in the price, but may be billed separately.

Less than maximum prices. Maximum Price Regulation No. 136 as Amended allows less than maximum prices.

Petitions for amendment and adjustment. To petition for amendment or adjustment of governmental contracts and subcontracts, under $200,000 with the Navy and under $5,000,000 with the Army, file under Procedural Regulation No. 6. For other amendments, file under Procedural Regulation No. 1.

Records to Be Kept By Supplier

The following records are to be kept available for inspection by representatives of the Office of Price Administration: Each machinery service performed after July, 1942, such record containing:

(a) Name of the person for whom such services were performed.

(b) Date of the transaction.

(c) Identification of the services providing a reference to a price list of production records.

(d) The net charge for the machinery service.

(e) Additional records showing the precise basis upon which maximum charges have been and are determined.

Reports Required of Suppliers

Most machinery service suppliers are required to file only under "Machinery Services With List Prices." The other reports listed here arise only in the few special cases indicated by the report titles.

Machinery Services With List Prices Under Section 1390.9(a)(2). Maximum prices—machinery services—with published or confidential price lists. Report to contain the following charges in effect March 31, 1942, for machinery services:

1. Machine-hour rates.
2. Charge sheets.
3. Discount sheets.

Machinery Services Without List Prices. If your price for a machinery service charge has been computed in accordance with the provisions of the pricing formula outlined above, no report of this is required unless specifically asked for by OPA, but records must be kept available for OPA inspection. Although no report need be filed for formula-computed charges, if you increase your charge for services without list prices, the following report is required:

Price Increases on Non-List Price Services Under Section 1390.18(g). Where the price computed by the formula represents an increase over the price charged on a previous occasion, or above the original contract price (not assignable to changed specifica-

(*Continued on page 57*)

Determining Motor Loads From Ammeter Readings

By Joseph A. Setter*

WITH THE accelerated pace of the war production program, many machines and factories are now working around the clock. This means in many instances that some machines are being loaded with heavier production schedules than they were originally designed for, while others are underloaded. Too, the great demands for new machinery have led to the installation of much used equipment which in many cases is overmotored in relation to the immediate job.

It is a well-known fact that underloaded induction motors operate at very poor power factor and draw an excessive amount of lagging current. This in turn wastes vitally needed power in all feeders and in distribution equipment clear back to the generating station power.

Frequently these difficulties can be overcome by checking the load and, on the basis of such a check, switching motors on some of the machines to improve the load factor. The purpose of this article is to present a simple method whereby loading on integral-horsepower induction motors can be determined with practical accuracy by means of a hook-on volt-ammeter.

This method is of unknown origin but has been used with practical results by several plant electricians for a number of years, and has been checked for accuracy with design data of motors. With this method it is not necessary to lose productive time, because the leads to the motor need not be disconnected to make the tests.

Here are the seven simple steps to be taken in using this method:

Fig. 2. Demonstrating method of measuring current with hook-on ammeter. This type of meter is especially convenient for use with motors that cannot be taken out of service easily.

(1) Plot a chart with "% hp" against "% full-load amperes" for each motor.

(2) Locate point A as 100 per cent from motor nameplate reading of amperes at rated hp of motor. (Also it is assumed that the nameplate voltage is maintained.)

(3) Disconnect motor from load and read no-load amperes with ammeter and locate point C in per cent of full-load current (approximately 25 to 45 per cent depending on speed of motor).

(4) Locate point D halfway between O and C and draw line DA.

(5) Locate point B on line DA at 50 per cent of the motor hp rating and draw CB.

(6) Then line ABC will be the approximate curve of the per cent horsepower output of the motor plotted against per cent of motor current.

(7) For any motor current, read in amperes, calculate the percentage of the full-load current, follow horizontally until line ABC is intersected. Then drop down vertically and read the per cent load of the rated hp of the motor.

If it is not convenient or feasible to disconnect the motor from the load as suggested in Step 3, then the no-load current can be taken from Fig. 1. For example, an 1800-rpm motor has a no-load current of approximately 25 per cent which is the average for motors up to 100 hp. Lower speed motors have higher no-load cur-

(Continued on page 63)

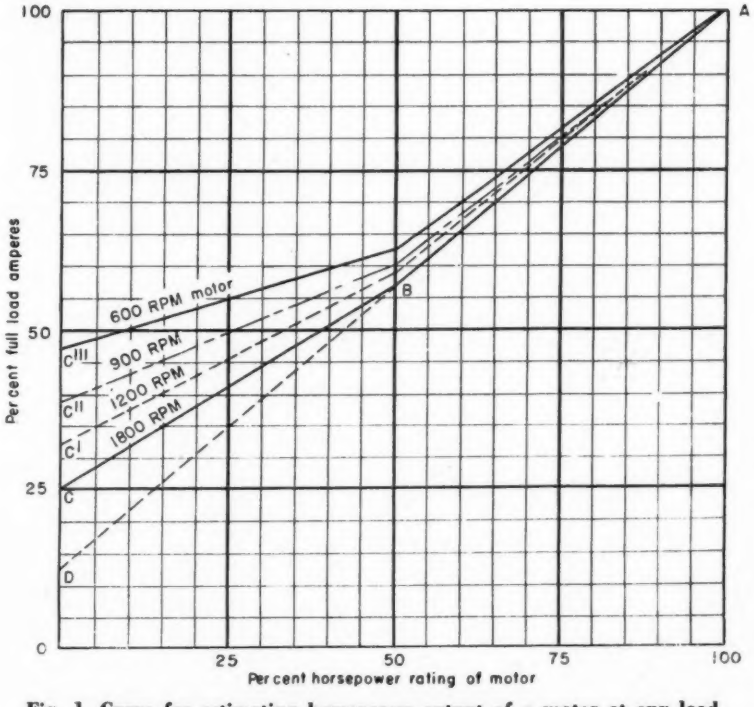


Fig. 1. Curve for estimating horsepower output of a motor at any load by measuring load current with hook-on ammeter. This method gives output accurate to within 2 or 3 per cent of actual output.

*Mr. Setter is in the Industrial Department of General Electric Company, at Denver, Col.

Electrical Repair Equipment is Essential War Activity

By Nat M. Johnson

WAR-TIME needs make the new plant of Fagan Electric Company of invaluable service to Arkansas and adjacent states. When new units cannot be obtained, it is well that there is a plant in Little Rock in which can be reconditioned or completely rebuilt, motors from the small fractional horsepower to 1,000 hp, and transformers up to 1,000 kva.

In the contracting end of the business the Fagan company can handle the complete building of a distribution system, including substation; or the entire wiring from substation down to the last small motor or appliance outlet. Jobs now under construction or recently completed include the Arkansas Ordnance Works (everything from the substation on to the buildings, and all operating machinery), Pine Bluff Arsenal, Longhorn Ordnance Works, in Texas (the whole outside distribution job, including a 10,000 kva substation), and an alumina plant in Arkansas, subsidiary of Aluminum Company of America, said to be the largest plant of its kind in the world.

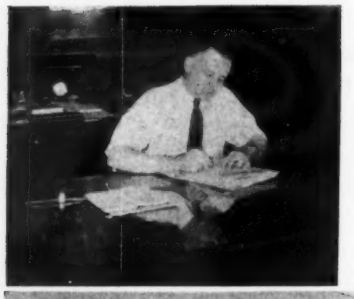
War-time secrecy forbids the describing of any part of these huge jobs, interesting as they would be—but the pictures presented with this article will take the reader through the Fagan plant on Spring Street, at Ninth, in Little Rock. In regard to those big electrical contracts, suffice it to say that at the peak there were over 600 men on the Fagan payroll.

The new building is 100 feet wide by 150 feet deep; with a "crane yard" 50 x 150 feet, adjoining, making the entire plant 150 feet square. On the yard is a 20-foot crane for unloading and loading the big motors and transformers. Many transformers are received from Texas and Louisiana, as well as Arkansas, and proper equipment is needed for handling them.

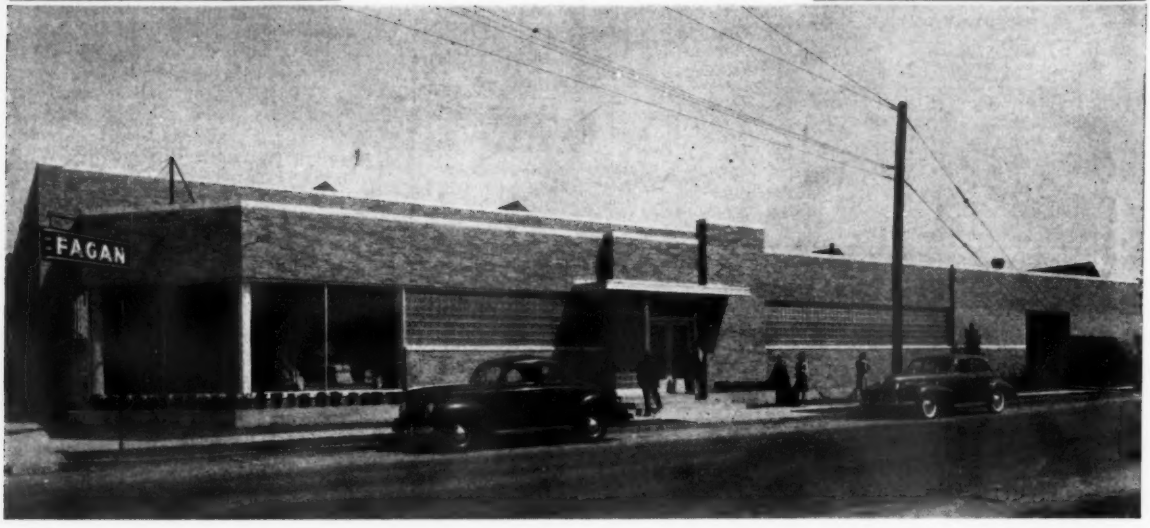
Inside the large, daylight lighted shop, there is a break-down test board for transformers. The electric service is brought in at 440 volts and with their own transformers it can be stepped up to 66,000 volts. Another test board will give a complete break-down on motors of the larger sizes.

The new shop includes an assembly-line set-up, with machines for measuring, cutting and shaping wire for coils, winding coils for both motors and transformers, and lathes and milling machines for making bearings and

(*Continued on page 60*)



Below: Exterior of modern new electrical repair plant of the Fagan Electric Co., in Little Rock, Ark. Right, Mrs. Anna A. Fagan, owner of the business, and at left, her son, Ellis M. Fagan, who is associated with her in its operation.



Scenes in the well-equipped Fagan shops: (1) Large transformer test panel. (2) Transformer coil winding machines. (3) Motor test panel. (4) Stator coil spreaders. (5) Machine shop. (6) Infra-red baking tunnel. (7) Small motor repair department (8) Dynamometer motor testing equipment. (9) Display room.

Protection for Motor Circuits

Part--3

By B. Z. Segall*

This is another of the series of articles on Industrial Wiring Practice. This continues the discussion of the general requirements entering into the protection of motor circuits against overloads and short circuits.

AS POINTED out in previous discussions, motor circuits, control apparatus, etc., must be protected from short circuit currents and grounds. Primarily, this is accomplished by providing branch circuit overcurrent protection. The devices installed for this purpose must be capable of carrying the motor starting current without interrupting the operation of the motor. For this reason it will be found that the fuses or circuit breakers used for this protection will have a higher rating than the motor running overcurrent protection.

These branch circuit overcurrent units for individual motors are generally rated from 150% to 300% of the motor full-load rated current. The exact amount of over-rating will depend upon the type of motor, its use, its starting duty, etc. In some special cases as much as 400% of the motor full-load current rating may be used for determining the size of the overcurrent unit.

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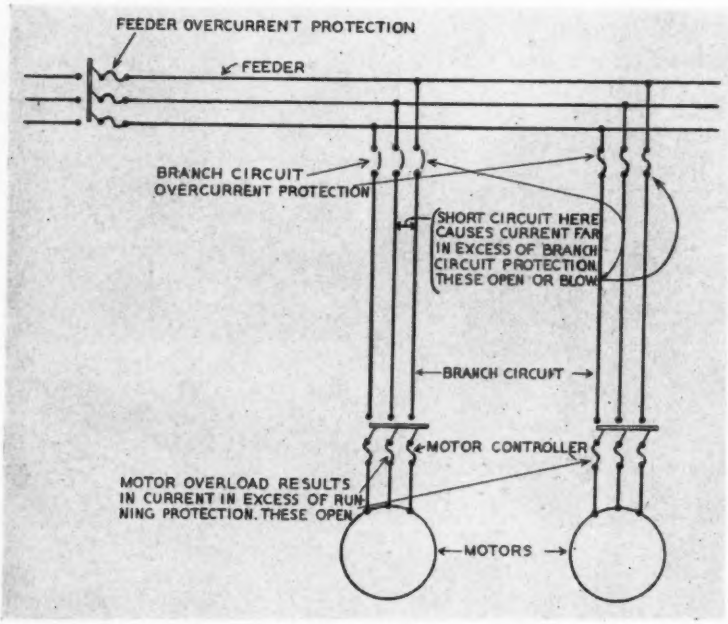

FEEDER OVERCURRENT PROTECTION
FEEDER
BRANCH CIRCUIT OVERCURRENT PROTECTION
SHORT CIRCUIT HERE CAUSES CURRENT FAR IN EXCESS OF BRANCH CIRCUIT PROTECTION. THESE OPEN OR BLOW
BRANCH CIRCUIT
MOTOR CONTROLLER
MOTOR OVERLOAD RESULTS IN CURRENT IN EXCESS OF RUNNING PROTECTION. THESE OPEN
MOTORS

Fig. 39. Branch circuit protection for motors as an exception to general rule for overcurrent protection of conductors is illustrated here, showing inherent protection offered by system. The capacity of the feeder is such that it will handle 125% of rated current of largest motor plus running current of all other motors. The branch circuits should have minimum capacity equal to 125% of motor full-load current. The branch circuit overcurrent protection, either in the form of fuses or circuit breaker, are generally rated 150% to 300% or even 400% of the motor full-load current rating. The rating of motor running protection at the motor controller is generally 125% of motor full-load current but may be as high as 140% in special cases.

As shown in Figure 39, the branch circuit protection violates in principle, the general rules for overcurrent protection of wires. The conductors themselves are required to have a minimum capacity of 125% of the motor full-load current rating. Protecting these conductors by overcurrent devices rated from 150% to 400% of this motor current rating, in theory, develops a hazard in the wiring installation.

Over-Load Possibilities

From a practical standpoint, however, such installations are not hazardous. Only two possibilities present themselves for the flow of excessive current in the motor circuit. First, an over-load may develop from a short circuit within the branch circuit wiring system, the motor itself, the control apparatus, etc. Short circuit currents are usually very high, well beyond the capacity of the branch circuit fuses or circuit breaker and the motor running overcurrent devices. Therefore, short circuit overloads in the wiring between the branch circuit protection and the motor running protective device will always, as a rule, cause the branch circuit device to disconnect the motor and its entire circuit from the supply system. A short circuit in the wiring or equipment between the motor running protective device and the motor itself, of course, will open the running protective devices and usually the branch circuit units also.

The second possibility is the overloading of the motor itself. This current must pass through the motor running protective device and will therefore open these units and disconnect the motor from its source of supply at the motor controller or at some other point of the circuit. It should be remembered that both the running protective device and the conductor capacity have the same gen-

eral rating, i.e., 125% of the motor full-load current rating.

Motors may have similar and equal ratings but require different starting protection. Thus two, 5 hp, 220-volt, 3-phase motors may each draw 15 amperes at full load. However, it may be found that the branch circuit fuse for one motor is continually blowing whenever the motor is started, whereas the same size fuse for the second motor may not require any replacement.

Motors are designed for similar rating but may have quite dissimilar starting characteristics. Thus we find squirrel cage motors classified as: (a) normal torque, normal starting current; (b) normal torque, low starting current; (c) high torque, low starting current; (d) low torque, low starting current; and (e) high slip (high starting torque for punch presses). Other special types are available for other conditions of loading and operation.

To differentiate between the various starting requirements and thus guide the motor circuit designer in his calculations for branch circuit over-current protection, the Code requires all new motors to have an identifying letter. This letter indicates the kilovolt-amperes per horsepower required by a motor with locked rotor. In other words, the Code letter is a practical measure of the inrush current at starting of a motor from a dead stop, with full rated motor voltage applied directly to the motor windings. Fifteen classes are recognized as shown below:

Code Letter	Kva per Hp, Locked Rotor
A	0— 3.14
B	3.15— 3.54
C	3.55— 3.99
D	4.00— 4.49
E	4.50— 4.99
F	5.00— 5.59
G	5.60— 6.29
H	6.30— 7.09
J	7.10— 7.99
K	8.00— 8.99
L	9.00— 9.99
M	10.00—11.19
N	11.2 —12.49
P	12.5 —13.99
R	14.0 —& above

Thus a 5 hp, 220-volt, 3-phase motor with a letter B would require from (5x3.15) or 15.75 kva to (5x3.54) or 17.70 kva at starting. The approximate value of locked rotor current under these conditions would vary from 15,750 /(1.732x220) = 41.3 amperes to 17.700 / (1.732 x 220) = 46.4 amperes.

The same motor with a letter M would require (5x10) or 50 kva to (5x11.19) of 55.95 kva at starting and this would require an approximate locked rotor current of 50,000/(1.732x220) = 131 amperes to 55,950/(1.732x220) = 146 amperes. Naturally, the branch circuit overcurrent protection designed for the first motor would not be adequate for the second machine.

The National Electrical Code does not require calculations to be made as above for each and every motor. Various tests have been made and these show that motors having certain code letters may be combined as a class and the branch circuit overcurrent protection calculated as a certain percentage of the motor full-load current rating. These combinations are shown in Table 26, page 324 of the Code.

Thus all motors having a letter

(*Continued on page 58*)

TABLE 26—MAXIMUM RATING OR SETTING OF MOTOR-BRANCH-CIRCUIT PROTECTIVE DEVICES FOR MOTORS MARKED WITH A CODE LETTER INDICATING LOCKED ROTOR KVA

Type of Motor	Per Cent of Full-Load Current: Fuse Rating (See also Table 20, Columns 7, 8, 9, 10)	Circuit-Breaker Setting: Instantaneous Type	Circuit-Breaker Setting: Time Limit Type
All AC single-phase and polyphase squirrel cage and synchronous motors with full-voltage, resistor or reactor starting:			
Code Letter A	150	.....	150
Code Letter B to E	250	.....	200
Code Letter F to R	300	.....	250
All AC squirrel cage and synchronous motors with auto-transformer starting:			
Code Letter A	150	.....	150
Code Letter B to E	200	.....	200
Code Letter F to R	250	.....	200

For certain exceptions to the values specified see sections 4324 and 4342. The values given in the last column also cover the ratings of non-adjustable, time-limit types of circuit-breakers which may also be modified as in section 4342.

Synchronous motors of the low-torque, low-speed type (usually 450 RPM or lower), such as are used to drive reciprocating compressors, pumps, etc., which start up unloaded, do not require a fuse rating or circuit-breaker setting in excess of 200 per cent of full-load current.

TABLE 27—MAXIMUM RATING OR SETTING OF MOTOR-BRANCH-CIRCUIT PROTECTIVE DEVICES FOR MOTORS NOT MARKED WITH A CODE LETTER INDICATING LOCKED ROTOR KVA

Type of Motor	Per Cent of Full Load Current: Fuse Rating (See also Table 20, Columns 7, 8, 9, 10)	Circuit-Breaker Setting: Instantaneous Type	Circuit-Breaker Setting: Time Limit Type
Single-phase, all types	300	.....	250
Squirrel-cage and synchronous (full-voltage, resistor and reactor starting)	300	.....	250
Squirrel-cage and synchronous (auto-transformer starting)			
Not more than 30 amperes	250	.....	200
More than 30 amperes	200	.....	200
High-reactance squirrel-cage			
Not more than 30 amperes	250	.....	250
More than 30 amperes	200	.....	200
Wound-rotor	150	.....	150
Direct-current			
Not more than 50 H.P.	150	250	150
More than 50 H.P.	150	175	150

For certain exceptions to the values specified see sections 4324 and 4342. The values given in the last column also cover the ratings of non-adjustable, time-limit types of circuit-breakers which may also be modified as in section 4342.

Synchronous motors of the low-torque low-speed type (usually 450 R.P.M. or lower) such as are used to drive reciprocating compressors, pumps, etc., which start up unloaded, do not require a fuse rating or circuit-breaker setting in excess of 200 per cent of full-load current.

These tables, referred to in the accompanying article, are reproduced from the 1940 Edition of the National Electrical Code. They indicate the maximum rating or setting for motor-branch-circuit protective devices. Table 26, above, is for use with motors marked with Code letters, while Table 27, at right, applies to motors not marked with Code letters.

Unusual Circuit Arrangements For Four-Lamp Ballasts

By Carleton B. Fox

The new four-lamp ballast for 100-watt fluorescent lamps offers a number of advantages including a 50 per cent reduction in ballast materials, a 46 per cent cut in energy losses, and considerable savings in circuit copper because of the higher operating voltage. The application of these higher voltage ballasts to existing distribution systems may entail some difficulty. The various possibilities are discussed in this article.

A SHORTAGE of critical material has stimulated the design of a new fluorescent fixture that requires less ballast equipment than other types. The fixture is equipped with four 100-watt tubes and is offered for circuits that furnish either 254, 265, or 277 vote potential. To obtain this unusual voltage, three single phase transformers are connected with their secondaries in "Y." In a connection of this type three-phase power voltage of either 440, 460, or 480 volts is then available for motors.

It is being emphasized that this new system lends itself most readily (if not exclusively) to very large defense plants where tremendous lighting loads are involved. It will be obvious that one wire to the fixture (the neutral) will have no potential to ground since the center of the Y will be grounded. The other conductor will be a phase wire that will carry full potential such as 254, 265, or 277 volts to ground as the case may be. In the nature of things, these fixtures will be mounted high and far out of reach of all but the maintenance men, and it is to be hoped that any restrictions against voltage of these values to ground will be lifted, for in addition to saving in critical material, there will be a wattage saving due to the elimination of one ballast.**

It is anticipated that utilities and electrical contractors will receive inquiries from existing industries where 254/440 three-phase Y is not available. Nearly all of these super lighting installations involve capacities far in excess of those available from standard 120/240 single-phase distributions that already exist in the plant. As a rule these distributions are already fully loaded and had best remain intact so that standard lighting voltages will remain available for equipment that normally requires 120 volts.

Figure 1 shows how "booster" transformers can be connected to 120/240 volt single-phase systems, to supply a voltage that is adapted to the new ballast. These "10% boost" auto-transformers are a fairly common stock article and might be available with adequate priorities. While the diagram at a glance might indicate an "unbalanced" condition between the two main conductors that energize the 240 volt windings of the auto-transformer, a second glance will show that such is not the case. The plan has considerable merit insofar as maximum voltage to ground is concerned for it would be no greater than 144.

Let us assume that it is desired to supply this new lighting equipment with energy direct from power supply of standard voltages. It is quite fortunate that low voltage step-down transformers of a type that will handle the situation are fairly plentiful. Most transformer manufacturers have made them for years in nearly all sizes up to approximately 50 kva in both air cooled and oil cooled models. They have recently become quite popular for use in "lighting load centers." The primary windings are insulated from the secondary windings. Primary windings consist of two coils which can be connected in parallel for 220 volts or in series for voltages of the 440 volt range. The secondary windings can be connected in series for lighting supply of the 110/220 volt range or they can be connected in parallel for straight 110-volt supply, in which latter case the secondaries will deliver approximately twice the amperage that is drawn from the line by the primary. It is believed that many cases will present themselves

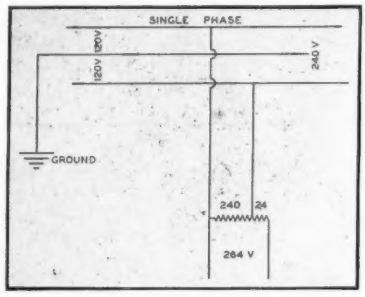


Fig. 1. Single-phase system using auto-transformer to adapt new type ballast to existing 120/240 volt installation.

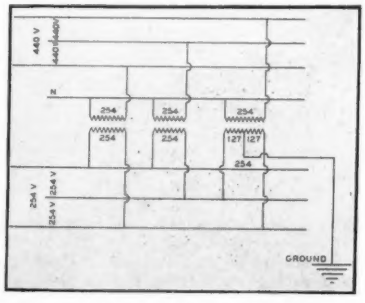


Fig. 2. Three 1-to-1 transformers connected to a 440-volt delta system provides a 254-volt delta circuit for new type ballast.

**EDITOR'S NOTE—The Emergency Committee of the Electrical Committee, of the National Fire Protection Association, at its meeting on August 4 carefully considered the situation and in order to recognize the conservation of critical materials and the more efficient use of electric current gave recognition to this method of lighting through the following interpretation:

"It was not the intent of the Electrical Committee that the expression 'shall not exceed 150 volts to ground', which appears in the fourth line of section 2105 of the 1940 National Electrical Code, should be interpreted as applying to circuits supplying lighting only in industrial establishments where the fixtures are not less than 8 feet from the floor and do not have individual switch control."

whereby it will be found more economical to install the new type fixtures even though to do so would mean installation of transformers of the above type.

We must not lose sight of the fact that considerable saving in circuit copper results when the fixtures are supplied by voltages higher than normal, and reduction in line drop for a given wattage per circuit is a subject very worthy of consideration — particularly when we are dealing with fluorescent lighting.

440-Volt, Three-Phase Delta

Figure 2 shows how three transformers would be connected to a 440-volt, three-phase delta system. The primaries of each are connected as though they were intended to receive 240 volts. One terminal of each transformer is connected to a phase wire and the other terminal of each primary is tied in to a common wire, designated as N, which forms the center of the Y. Each primary actually receives 440 volts divided by 1.73 or approximately 250 volts. No serious objection can be raised to this slight overvoltage that the primaries receive. Thousands of these transformers are now in use to reduce power voltages to lighting voltages, and, while there would be a slight increase in core loss, the insulation is ample.

The secondaries of each transformer are connected as though they were intended to supply 120/240 volt, single-phase lighting, but the neutral tap is not used for distribution purposes. The transformer really becomes a 1 to 1 ratio affair with the secondaries delivering 254 volts. The secondaries are then connected in

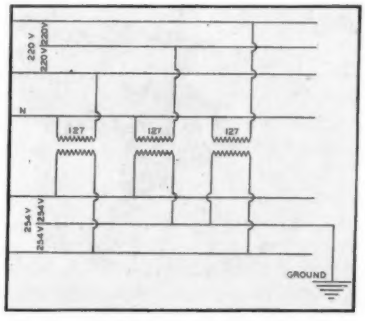


Fig. 3. Three 1-to-1 transformers with primary windings in parallel are shown here connected to 220-volt delta system in order to obtain 254-volt delta circuit for new type of ballast.

For a detailed explanation of the operating principles of the four-lamp ballast, see ELECTRICAL SOUTH for Dec. 1942, page 27.

delta. One of the neutral taps can be grounded in which case there would be only 127 volts to ground between two of the phases, and approximately 220 volts to ground from the other phase.

220-Volt, Three-Phase Delta

The same principal is used if the power voltage in the plant is nominal 220-volt, three-phase, delta. The connections would be as shown in Figure 3, the only difference being that the transformers would be used in reverse. The coils that would ordinarily deliver 110 volts nominal (when connected in parallel) are now used as primaries in the Y connection. The

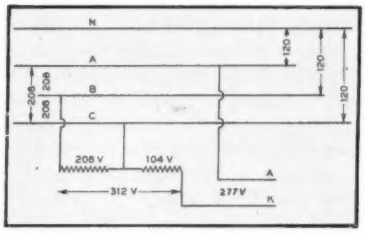


Fig. 4. The same 1-to-1 type transformer can be used in connection with 120/208-volt four-wire system when connected as shown. (Only one transformer is shown connected, but three similar connections can be made in order to balance load over three phases.)

coils that would ordinarily be used as primaries on a 220-volt power system are now used as secondaries and are so connected that they double the voltage of the other coils. In this case the coils in the Y connection receive 220 volts divided by 1.73, or approximately 127 volts, and the secondaries deliver double that amount, or 254 volts, to the delta connection, for supply to the lamps. However, the transformers of the type we are dealing with have no neutral tap half way between the 254 volt terminals.

120/208-Volt Systems

Figure 4 shows the connections and Figure 5 shows the vectors involved where it is desired to use these standard transformers to boost the pressure to 277 volts.

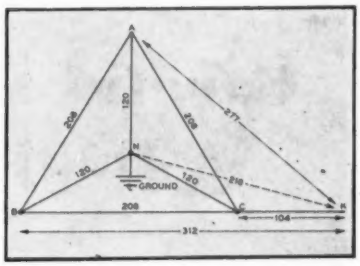


Fig. 5. This diagram indicates the vector relations of the voltages obtained from the connections shown in Fig. 4.

It will be remembered that these fixtures are optional for 254, 265, or 277 volts, each of these pressures being resultant when 440 volts, 460 volts, or 480 volts respectively are divided by the square root of 3. For simplicity only, one transformer and one vector are shown and the 277 volt single phase supply for the fixtures could serve a distribution panel of one-third of the new lighting load. In order that a balanced condition could be obtained a second transformer could likewise be connected so that it would receive a primary pressure between A and B phase, with C phase used as the open connection. This panel would serve the second third of the new lighting load. The third transformer would receive its 208 volts from A to C with the lighting taken from phase B as the open phase.

Reference to Figure 5 will show that from B to K there is an additive in-phase voltage of 312, but this is not used for distribution. The 277 volts are obtained from A to the free end of the low voltage coil of the transformer, represented by K. The windings of the transformer thus connected between B and C phase are those that are ordinarily used as primaries for nominal 220-volt supply, and the "boosting" is accomplished by the coils that would ordinarily be connected for nominal 110-volt, two-wire, lighting. Since the source of the supply is 120/208-volt, three-phase, four-wire Y, one of the conductors that serves the lighting system would show 120 volts to ground and the other would show the vector distance from K to N, which is approximately 218 volts to ground. Do not ground any of the feeders or circuits that supply the new fixtures for there is already an established ground.

Careful Study of Tax Problems Justified by New Rates

By Arthur Roberts

THE electrical contractor or dealer can effect tax economies if he takes advantage of all the tax-saving opportunities in the Internal Revenue Code. When income tax rates were low, it meant less of a financial loss to overlook deductions. Today, with war restrictions narrowing profits to the danger zone, the taxpayer must make sure that the taxable base represents the true net income, otherwise, he may find it difficult to meet his tax payments when due.

The following suggestions based upon a study of the 208-page tax bill for 1942 and previous legislation plus our observations of the malpractises followed by contractors and dealers on income tax matters in the past, will help keep tax expense at minimum.

Any expense connected with an income-producing activity is deductible but just what is an expense and what is an addition to capital is not always clearly defined. There are borderline cases of this type, which may be considered an increase in capital or an expense. Where logical argument will support an outlay as an expense, treat it as such. Do not capitalize it. If you do, you increase your tax. Too often a taxpayer will capitalize repairs and maintenance to make the assets look healthier or because he considers the outlay an improvement. If a transaction can legitimately be considered a repair to property used in the production of income, it is deductible. Those contractors and dealers, who, in the past, have tried to fatten their net worth by considering repairs and improvements an addition to property value, should eliminate this practise from now on.

Be sure to deduct all losses of useful value. When the usefulness of a capital asset is terminated and it is discarded, the taxpayer may claim a loss for the year in which it occurred. Many contractors have lost out on this deduction in bygone years because they failed to report it in the proper year. Others have short-changed themselves on depreciation for the same reason. If you fail to take ample depreciation in one year, you can't make it up subsequently. If depreciable property is disposed of for causes other than depreciation or obsolescence, a deduction for the difference between cost and salvage may be allowed.

Depreciation on Equipment

The investment in tools, testing instruments and motor shop equipment varies among contractors, from less than $500 to more than $10,000. Deduction for depreciation will not loom large for those with small investments in working equipment, including property, but those in the higher brackets will find it worthwhile to check over their depreciation schedules, particularly if they are doing war work and using their equipment more than formerly.

The law permits accelerated depreciation on overtime work, depending on circumstances. In normal times, when a machine was operated 8 hours daily, a 10 per cent annual deduction from original cost may have been ample but today if the same equipment is operated for longer hours, an increase in the depreciation rate may be permitted.

If you are fortunate enough to obtain new equipment during the year, start deducting depreciation from the date received. Often contractors do not start taking deductions until the next year and lose the deduction for the partial year.

This also applies to improvements to property. If you put on a new roof or install a heating system, this is a capital expenditure, cannot be deducted in full, but you can get the outlay back by depreciating the investment yearly. This deduction is too often overlooked and the oversight is too costly to tolerate today with income tax rates the highest in our history.

If you make an improvement to a property you rent, you cannot deduct it in full either but this investment may also be depreciated. This is another omission that we have too frequently come across when checking back over the accounts of contractors or dealers who were leasing properties and it "upped" their tax payments. Improvements made by a lessor may be depreciated over the life of the improvement or the term of the lease, whichever is shorter.

In one case, a contractor with a 10-year lease spent $1,000 on a showroom for the display of electrical lighting fixtures and failed to take the deduction for depreciation the first year. That deduction was lost to him because he could not make it up the following year. He should have deducted $100 each year to write off the improvement over the 10 years. Use the straight-line method of depreciation, the original cost divided by the years of useful service.

Note the term "useful service". Depreciation should not be geared to the mechanical life of a working asset but to the useful life from a serviceable standpoint. Often there is a big difference because equipment will operate mechanically long after its usefulness from a serviceable standpoint is gone with the wind.

There are 8 different methods of depreciating properties. Once used on an income tax return, the method must be continued unless the Commissioner of Internal Revenue permits a change. Some contractors and dealers use reserves for depreciation, others just write down the assets on their books. The Treasury Department prefers the reserve method, also the straight-line method of depreciation. You will have fewer headaches with your returns if you follow the methods preferred by the income tax authorities.

Depreciation and obsolescence are estimates at best and the subject is one of accounting more than of tax, nevertheless, the taxpayer should see that his method of computation lines up with actual de-

preciation of useful value, that the annual deductions are ample, yet, reasonable, otherwise, he will pay too much tax. A taxpayer is not limited to any one method as long as the depreciation allowance can be proved reasonable.

Make Complete Returns

Make each year's return complete in itself. If certain expenses are omitted during the taxable year, you cannot deduct them from the income of the next year, and such omissions are often many when the taxpayer waits until the last minute to file returns or keeps inadequate records. Enter all accrued items, which are expenses due but not yet paid, for deduction in the taxable year, otherwise, there will be an overstatement of liability.

Taxpayers sometimes overlook interest, payroll and other obligations due to the last day of the taxable year because these obligations haven't been paid yet. Prorate these expenses to the end of the taxable year and deduct from gross income even though you pay them after the end of the year. Accounts paid because of injuries received by employes are proper deductions as expenses, limited to the loss not covered by insurance or otherwise. If no compensation is received, the loss is fully deductible within the year. Losses incurred in any business transaction are ordinarily deductible, provided they are closed transactions sustained during the taxable year.

If equipment is discarded, any claim for loss must be made in the year in which the action is taken. In general, the income tax law is concerned with realized losses and realized gains sustained during the taxable year, hence, the taxpayer should see that his tax return is complete, otherwise, he may not be allowed credit in subsequent years. A misunderstanding of this general principle of income tax preparation has caused many electrical contractors and dealers to lose money in the past and they should make amends in the future.

With merchandise and materials for civilian use as scarce as they are, there is little likelihood that you can show much of a loss on inventory but if you do experience a loss, you can get a deduction so go over your stock carefully with this in mind. Obsolete and outmoded items may be written down. Damaged, shopworn, imperfect or traded-in items should be valued at prices at which the goods are offered for sale, not later than 30 days after inventory date.

Deduct for bad debts in the year they are ascertained worthless, otherwise they may not be allowed. If you collect some or all of these debts after write-off on a tax return, you must report the amount as income in the year received and pay a tax thereon. If you suffer a loss in a taxible year without benefit of the depreciation deduction, you may be permitted to charge back this expense and start deducting on the increased figure in subsequent years. Heretofore, you took such losses on the chin but court decisions and amendments to the Internal Revenue Code have liberalized inequalities in the tax law so that you can get relief in many cases where it previously was denied. However, those contractors or dealers who fail to keep abreast of income tax amendments from year to year, also court decisions affecting deductions, often overlook such changes and pay more tax.

Often unfamiliarity with income tax laws penalizes members of this industry into passing up deductions to which they are entitled. For example, one electrical contractor did not take credit for a loss carry-over as legalized in the 1939 tax bill because he did not know it was deductible. This brings into sharp relief the necessity of studying tax laws more carefully from now on.

Heretofore, the usual procedure was to wait until the last minute to file his return, then get the figures with or without the aid of an accountant, arrive at the taxable net income and send the result to the nearest tax office. Whether or not the taxpayer had effected maximum economies was something he assumed beyond his own abilities.

Tax Problems Need More Study

From now on, the electrical contractor or dealer must revise his modus operandi on tax matters and consider his tax problems throughout the year the same way he supervises installations, job costing or merchandising routine. He must judge all business operations in the light of how they will affect his tax. He must check the trend and size of net earnings closely with the tax rates to give him a preview of pocket-profit, the sum left over after tax deduction.

The 1942 tax bill levies the highest tax rates in our history and puts tax into the category of a major expense; hence, every business man must give prime consideration to the problem—not just before filing time but all through the year. Only in this way, can he take advantage of all tax-saving opportunities.

In the 1942 tax bill, there are a number of changes which permit the taxpayer a better break on operations. For example, in bygone years, if you lost $1,600 and had included in your figures $1,200 for bad debts, you would have gone in the red for $400 without the bad debt deduction and you weren't taxable anyhow. Thus, the inclusion of $1,200 in bad debts did not benefit you. You lost the deduction with no redress. But, if you collected on such debts in a subsequent year, you had to pay a tax on recoveries so you paid a tax twice on the same income: once when you made the original sales and later when you collected on the bad debt recoveries. If the debts had been ascertained worthless in that year, you couldn't hold them over to the next so you were stymied from all angles. Congress corrected this inconsistency in the 1942 bill. If you write off bad debts in a loss-year, you need not pay a tax on recoveries received in subsequent years.

Another amendment in the 1942 tax bill that eases your tax burden is the carry-back provisions, by which you can carry back net operating losses for 2 years, but not prior to January 1, 1941. If you lose money in 1943 and earned a profit in 1942 and 1941, you may carry back the 1943 loss to the previous 2 years and get credit. This amendment will come in mighty handy to those taxpayers who recorded profits in the more abundant years of 1941 and 1942 but who will show losses in 1943 due to shortages of civilian goods, price control and other wartime restrictions.

Then, there was a carry-over provision in the 1939 amendment to the Internal Revenue Code that offers additional relief. If you can't carry back a loss, you can carry it over to the next 2 years and take credit for it. In this way, you can ride the turbulent ups and downs that every business will most likely experience for a number of years

(Continued on page 54)

Small Appliance Service Guide

By Jack W. Goans*

THIS SMALL appliance service guide is not a substitute for manuals giving detailed service instructions on specific appliances. However, it contains numerous suggestions as to the possible cause of various small appliance operating difficulties. Every service man should be familiar with these suggestions and should learn to make the simplest tests first before "going into" the appliance that is giving trouble. This practice will save much time.

COFFEE MAKERS AND PERCOLATORS

Will Not Heat—blown fuse in branch circuit or in percolator. Defective cord or terminals may have been used on wrong voltage.

Coffee Too Weak—not enough coffee, not allowed to heat long enough. For best results allow coffee to settle.

Coffee Bitter—coffee allowed to boil too long or stale coffee used. Percolator not properly cleaned.

Coffee Maker Will Not Percolate—not enough water used, pump may be clogged. In automatic percolators or coffee makers once the automatic feature has operated and light has come on, the percolator will not percolate again unless it is turned to a higher setting or allowed to cool.

Glassware Cracks — allowing water to fall on glassware while hot or permitting liquid to boil over. Allowing appliance to operate without sufficient amount of water. Placing cold water in hot glassware or hot water in cold glassware. Placing it on concentrated heat. If to be used on flame type heat place appliance on baffle plate.

Coffee Boils Over—too much water placed in lower bowl, too much coffee placed in upper bowl or allowed to heat too long.

Coffee Will Not Pass from One Bowl to Another—seal between upper and lower bowls disturbed. Rubber cork may be worn. Filter may be clogged. Lower bowl on hot stove too long or not long enough. Time not allowed for lower bowl to cool.

Lower Bowl Hard to Clean—place small pieces of soap in lower bowl, connect as in the regular operation and allow to heat. Before doing this if filter cloth is used, remove as soap flavor may remain. Replace filter cloths frequently.

CURLING IRONS

Will Not Heat—loose connection at wall plug, blown fuse, defective cord or defective element.

Will Not Hold Hair—clamp has been bent out of shape. Not enough hair placed between clamp. Clamp not properly adjusted over small projecting knob on ferrule on handle.

Supply Cord Has Tendency to Scorch—curler operated with cord bunched, extend cord full length. Cord partially immersed in water, dry cord thoroughly. Cord may be frayed or worn.

EGG COOKERS

Will Not Heat—defective cord, wall socket, terminals or blown fuse.

FOOD MIXERS

Will Not Operate—blown fuse, loose connection, defective cord or defective motor.

Beaters Stick or Are Loose—see that beaters are properly locked in sockets. Mixture too heavy.

Bowl Does Not Revolve—consistency of mixture too thin. If large bowl is used, beaters should be moved toward side of bowl. Excessive friction in turntable socket, remove turntable and apply light oil.

Does Not Beat Properly—improper speed used. Beaters in improper position. Beaters may be too close to bottom of bowl.

Does Not Whip Cream Properly—speed too high, cut down speed. Consistency of cream not proper for whipping, use heavier cream. Improper whipping paddle used.

Juice Extractor Cuts Fruit and Does Not Remove Juice — speed used too high, use lower speed. Hold fruit lightly on extractor, fruit too ripe or reamer worn.

Motor Will Not Anchor—caused by improper adjustment.

Oil Dropper Does Not Operate—due to improper adjustment.

HEATING PADS

Will Not Heat—look for blown fuse, broken cord, defective switch or burned out element.

Slow to Heat—the wattage in most well designed heating pads has been purposely kept as low as possible in order to minimize danger of overheating. A safe pad requires from 10 to 20 minutes to come up to the desired temperature. Advance to higher heat if too slow.

Pad Scorches or Gets Too Hot—pad may have been wetted. May have been abused by using pins.

Pad Has Become In-Operative—caused by using pins, or getting wet. May be defective switch, defective cord, defective terminals or defective element.

FLAT IRON

Iron Does Not Heat—wall plug may be loose in outlet, carefully spread prongs outward. Fuse may be blown in branch circuit. Cord may be defective, have good test cord in tool kit. If iron is automatic, it may have been damaged by dropping. Thermostat may be defective; if no replacement is available, wire around thermostat until one is available.

Appliance Plug Loose On Terminal—appliance plug may be worn so that in the forward and backward motion of ironing it will cause an arc and this will cause unnecessary heating and pitting

*This guide to small appliance servicing was compiled by Jack W. Goans, dealer coordinator of Knoxville Electric Power and Water Board, Knoxville, Tenn., for use in connection with an appliance service school sponsored by the Power Board in cooperation with local appliance service organizations.

of contacts. Check iron plug and terminals for loose connections. A small piece of emery cloth will clean contacts; this is necessary for the proper heating of iron.

Iron Sticks to Wash—too much starch was used, or iron may have been used previously on starched clothes and not cleaned. Also, iron may have been used on clothes which contained traces of soap. Soleplate may be dirty—wipe or clean with damp cloth. Never immerse iron in water; use paraffin.

Iron Scorches Clothes—if automatic, control knob is set too high, or if non-automatic, the iron has been left on circuit too long. Ironing speed too slow or wash not damp enough.

Iron Not Stable on Heel Rest—may be due to shaky iron board, heel rest may have been bent, or appliance plug too long.

Handle Gets Too Hot—most irons are designed to rest on their heels, if they are placed on a flat stand the heat will rise and heat handle.

Control Knob Hard to Turn—this was done purposely to insure good contact.

Handle Becomes Loose—tighten handle bolt. If screws are used, remove handle and plug holes with small piece of wood coated with a good glue.

Iron Discolors—Starch left on soleplate used on garments where colors ran or grease may have dropped on soleplate. Stains on chrome plated irons may be removed by vigorously rubbing with damp cloth and polishing with dry cloth.

Wall Receptacles—the terminals may become annealed, losing their elasticity; this will in turn cause arcing, or may be caused by oversize terminal prongs being used. If replacements are not available, a very good repair job can be made by inserting shim behind terminals in receptacle; to do this, use thin blade screwdriver, cut shim from metal, insert behind terminals, and use one drop of solder to prevent slipping of shim.

CARE OF IRON CORDS

(1) Always have cord for every heating device, do not interchange cords. The heating device terminals may not be of same size and this will cause spreading of heating contacts, resulting in loose connections and terminal pitting.

(2) Always recommend the proper size cord set for every purpose. Example: do not use iron cord on 1000-watt iron that was purchased for 560-watt iron.

(3) Do not yank cord out of base receptacle. Take appliance plug firmly between thumb and forefinger and pull straight out of receptacle. Never remove terminal or replace terminal on any heating device without first disconnecting at the source of current.

(4) In using and storing appliance cords, do not kink or bend. This will cause fine wires inside cord to break. Wrap cord loosely around appliance.

(5) Never use 1000-watt heating device from 660-watt key socket. This will cause unnecessary heating and constitutes a fire hazard. If you are called away from your ironing for any reason, disconnect iron.

IRONERS

Does Not Operate—check fuses, circuit cord, connecting plugs or switches.

Motor Runs but Ironer Does Not Operate—check for loose coupling.

Shoe Does Not Contact Roll—check stop lever.

Not Enough or Uneven Pressure—roll padding packed due to ironing at one place. Remove padding and reroll. Shoe pressure not adjusted properly, shoe may be warped.

Not Enough Heat—extension cord of improper size and too long, heater switch defective, open circuit, improperly calibrated thermostat or clothes too damp.

Shoe Does Not Heat—poor contact, defective cord, heat switch, heating element or thermostat.

SOLDERING IRONS

Iron Does Not Heat Properly—work not prepared properly. Clean and make free from oils and greases, clean soldering tips and heat until solder flows smoothly.

TABLE STOVES

Will Not Heat—blown branch circuit fuse or cord broken under braid. Defective terminal plugs. Defective element.

Heats Too Slowly—switch not on high, may be low wattage stove or too much water used.

Uses Too Much Electricity—refer to Ohm's law for estimating.

SUN AND INFRA-RED LAMPS

Will Not Operate—blown fuse, defective cord, terminals, or bulb.

Will Not Tan—sun lamps for home use are designed to be safe, thus tanning of the skin will be obtained gradually after successive exposures. Tan will be obtained by being exposed to sunlamps, according to the medical profession; however, full benefits will be obtained without visible tanning. Some persons will tan, others will not.

Base Hums—the transformer which operate the bulb is usually located in the base; a slight hum is normal. However, if intensity of hum suddenly increases, this may be caused by loose bottom pan. Tighten loose screws and nuts, or look for loose lamination in transformer.

Bulb Contains Loose Mercury—this is a normal condition, the mercury pool is important to the operation of the bulb.

Mercury Spattered Inside Bulb—this is not always a defect and will clear up when bulb is operated again.

Bulb Blackens—this is a normal condition. When bulb is operating a portion of the mercury pool evaporates into a gas and when the bulb is turned off this mercury gas condenses, causing mercury to form on the glass.

AUTOMATIC TOASTERS

Second Batches of Toast Burn—this is caused by setting the automatic timer before pre-heating toaster. In all oven-type toasters there is a tendency for some heat to collect inside the toaster and it is necessary, before making a final setting of the timer, to pre-heat the toaster.

Toaster Operates In One Slot Only—a switch located at the back of the toaster controls this condition.

Timing Lever Hard to Operate—this is a normal condition as the timing lever in automatic toasters not only draws in and locks the toast rack, but must also start the timing mechanism and close the switch.

Toaster Smokes—this condition is normal with new toasters. Bread crumbs will also cause toaster to smoke.

Toast Racks Stick — tapping them lightly will cause them to realign.

NON-AUTOMATIC TOASTERS

Will Not Heat—check for blown branch fuse. Wall plug may be loose. Cord may be defective. After checking these, if toaster fails to heat, check elements. If element is burned, a very good repair can be made by first cleaning ends with a good cleaner, next use very small machine screw, two lock washers, two nuts, pull up snug, connect heater to current source, sprinkle good welding flux on connection, and while welding pull nuts up tight and snug which will prevent oxidation.

Toast Will Not Turn Over—door may be bent so it will not open fully. May be caused by type bread used: bread either too moist or not of the proper thickness; best results are obtained by having bread about ⅜-inch thick.

Toaster Gets Too Hot On Bottom—the best remedy is to use an asbestos pad.

Uneven Toast—bread too fresh. Bread is unevenly sliced or is curved so part of the sides exposed to the heat are uneven. Toaster not operated on even base.

COMBINATION TOASTERS AND WAFFLE IRONS

Will Not Heat—look for blown fuse, broken wire under braid, spread prongs outward and check elements.

Takes Too Long to Heat—intermittent contact on terminals and wall plug will cause this, not enough pre-heating time given or slow cooking speed designed purposely.

Gets Too Hot—possibly due to operating too long without food in it.

Waffles Too Raw—not enough pre-heating time or cooking time allowed, proper recipe not followed or appliance left open too long before beginning cooking operation.

Waffles Burn—proper recipe not followed. Not enough batter.

Waffles Stick—batter was poured before proper baking temperature was reached. After removing waffle be sure to close top of waffle iron for a brief interval of time before pouring new batch of dough.

Grids Discolored—iron allowed to overheat. Cooking fats, oil or food allowed to remain on grids.

(*Continued on page 52*)

Appliance Service Volume Produced by Advertising

LONG RANGE planning, combined with an advertising campaign, has successfully bridged the gap from an 85 per cent appliance sales business to a practically 100 per cent electric appliance repairing enterprise, which is paying dividends for the Dunn and Glosser Company, of Oklahoma City, Okla.

This firm, which has operated Maytag Sales and Service in Oklahoma City for many years, started accumulating repair and replacement parts and materials more than a year and a half ago when Ralph E. Dunn and John M. Glosser, its heads, saw the present emergency approaching and felt that their appliance sales business might slip out from under them.

Are they disheartened at the present slump in new appliance sales because of the war emergency? "No," answers Dr. Dunn, who says that revenue volume is as good, or even better, than in the freer and less troublesome days, and the firm's appliance repair business is doubled.

This situation did not just come into existence by the wave of a magic wand. It is the result of some clear thinking and a will to keep going and to take advantage of modern opportunities offered through advertising and the maintenance of a reputation built up through years of dependable servicing of electrical appliances.

Included in the advanced planning was the purchase and acquiring of a large stock of washing machine parts, belts, bearings and other repair and replacement materials. Later, useless appliances were taken apart and workable parts were placed in stock against a day of need.

Fruition of this foresightedness was realized in part by ability of the firm to repair or rebuild many old appliances, some of which had been discarded by users who had tried in vain to find repair parts or had thought that their days of service had ended. The company found many of these prospective customers through a special campaign of advertising, started in Oklahoma City daily newspapers on November 27, 1942, and scheduled to last to the middle of February.

Before the campaign was two weeks old, the company's shop was being swamped with appliances and equipment for repair, some of which was from 5 to 12 years old.

"Our repair department is now a week behind in delivery of repaired appliances," reported Mr. Dunn. "Our customers, however, are uncomplaining after we explain the critical shortage of materials and labor. In response to our special offer, good until January 1, to go into homes and oil appliances for a stipulated sum and to furnish free estimates on repairs if needed, housewives dug up old appliances, which had been all-but-forgotten, out of garrets, closets, garages and secluded corners.

"Our advertising, coupled with what people have learned about the growing scarcity of critical materials and freezing of appliances, have made housewives appliance conscious and have given them a greater appreciation of the value of electric appliances and service than they ever had before," Mr. Dunn concluded.

ELECTRICAL DISTRIBUTION
Engineering and Operation

Advisable Limits for Apparatus Overloads

Permissable overloading of electric apparatus as a means of conserving the vital resources of the electrical industry in wartime was discussed by Robert Treat of General Electric's Central Station Engineering Department in a paper presented recently at a meeting of the electrical system operators.

According to Mr. Treat, the real problem lies in determining the advisable limits for overloading. The emergency loading procedure must be followed cautiously if gains are to exceed losses. Mr. Treat pointed out that exact knowledge concerning the life of electrical insulation assemblies is limited because of the complexity of the problem.

"In any piece of electric equipment there are an almost infinite number of possible paths of electrical breakdown over the insulation assemblies incorporated in the device, and the continued availability of that device requires a sufficient resistance to every one of these paths at all times to prevent electrical failure. Conversely, only one path has to fail to put the whole equipment out of service," he said.

Mr. Treat explained that the testing of varnished cambric tape to potential breakdown after it had been subjected to time-temperature cycles early indicated no clear gradual decay of insulating properties.

"In fact," he said, "the electrical breakdown would often increase with time and temperature until the physical deterioration of the tape indicated a sudden electrical failure.

"The idea of testing the varnished cambric tape samples for physical deterioration developed and the vast majority of these tests actually have been readings of the ultimate tensile strength of such tape against varying time at constant temperature and varying temperature at constant time.

"The desirable range in such time periods plainly extends at least to the life of the equipment. In reality, it would be very helpful to be able to run such data out to 50 years, for instance, to be sure of general trends. Such ambitions, however, are not attainable in practical testing and therefore short time data have had to be speculatively extrapolated for the longer times."

Mr. Treat went on to point out that, in addition to the thermal effect of high temperature on apparatus insulation, there is a mechanical effect due to variations in temperature, encountered primarily in large rotating apparatus.

"As a machine heats up, the iron in the core and the copper in the coils expand, but not to the same extent. Unless the coils are so loose in the slots that they rattle around, which is seldom the case, this differential expansion causes chafing of the insulation, which must slip on the copper, on the iron, or within itself. Repeated cycles of heating and cooling due to changing loads and ambient temperatures may ultimately tend to destroy the insulation by this purely mechanical action. This same phenomenon also produces slight movements in the end turns which may ultimately chafe the insulation between turns to the point where turn shorts develop. Thermal deterioration and mechanical deterioration of the insulation cooperate to speed the day of ultimate failure."

When it becomes necessary to overload a piece of equipment, Mr. Treat recommended the following steps:

(1) Examine your own experience with that equipment, or with others like it, for any clues as to its ability to carry overload. A number of groups are working on this problem and if your own experience is inconclusive, possibly some of your fellow operating companies do have such experience.

(2) Look into the possibilities of improving heat dissipation if that is found necessary. Heat dissipation can sometimees be improved in rotating machines by adding blowers or fans, or possibly changing the existing fans so as to improve the ventilation. Increasing the hydrogen pressure in hydrogen-cooled generators from ½ to 15 pounds permits an increased loading of 15 per cent. The effectiveness of heat dissipation from transformers can generally be increased very substantially by blowing air on them, by spraying with water, or by providing them with forced oil circulation through external coolers. The external coolers may be either water cooled, air cooled or a combination of both.

(3) If you need this help, the manufacturer of the equipment

TUBES INCREASE CAPACITY—Welding on thin wall tubes has increased the cooling capacity of this 100-kva transformer, reducing the operating temperature from 65 degrees to 42 degrees Centigrade. Made of number 12 gauge steel, the 2½ -inch tubes are 52 inches long and are about 3½ inches from the tank. (Westinghouse photo.)

may be able to make useful comments based on his knowledge of its design. He may know of certain characteristics, margins or limitations not evident from the nameplate rating. When you do call on the manufacturer for such assistance, it will help him to help you if you give him as complete information as you can. This will include not only the complete identification of the equipment, but comments as to its operating history, and particularly, if you have them, indications of temperatures that have been reached, and the exact loading at which these temperatures were attained; in other words, a load heat run. This is of value because sometimes—and this applies to larger apparatus—the manufacturer is unable to make heat runs at full load and his present knowledge of the heating characteristics of the device may be based on synthetic tests or possibly only on calculations. In such cases data from the actual field runs are very helpful to him in giving you an intelligent opinion as to the probable effects of the overloading.

(4) When apparatus is operated at considerable overload, it should be carefully watched. An eagle eye should be kept on temperature, and the apparatus should be kept as clean as possible. Dirt almost always interferes with proper heat dissipation. Overload operation will require more vigilance and probably more maintenance than normal operating conditions if untimely destruction is to be avoided.

Camera Records Unusual Lightning Discharge

Reproduced here through the courtesy of C. H. McAllister, chief engineer of the Tide Water Power Company, Wilmington, N. C., is one of the most unusual pictures ever to appear in print. It shows the result of a lightning discharge to ground when it causes a phase to phase short.

During some construction work in the vicinity and under the transmission line, it was found to be desirable to set the ground relays on very long time setting. At the approach of a thunderstorm, the line was struck with lightning and the flashover to ground occurred on the switch insulator.

The resulting arc remained for

some time; long enough to destroy the insulators and to permit a picture to be taken.

At the failure of the insulators, one blade of the switch, standing open, fell across phases and the line relays operated. A combined phase to phase and phase to ground short circuit produced the effect shown here and it was estimated that an excess of 30,000 kva was involved in the arc.

A hole about two feet wide and four feet deep was blasted into the ground, and the soil around the pole was still warm twenty-four hours after the fault.

The switch, a three-pole Hi-Pressure contact, Type TTL, of the Railway and Industrial Engineering Co., was put back in service after having been reinsulated and cleaned up. The same parts were placed back in service, having amazingly withstood this terrific punishment.

Photoelectric Meter Tester Improved

AN IMPROVED photoelectric watthourmeter tester featuring a new electric circuit which requires no adjustment and remains unaffected by normal room lighting or by stray light falling on the phototube has been announced by General Electric Company. The unit's "electric eye" makes the testing completely automatic and allows the operator more time for other useful work.

The equipment has an inherently high accuracy, which makes possible reductions in the test running time of as much as 50 per cent. A concentrated light beam is focused (by lenses in the light source) on the disk of the watthour meter under test. Twice each revolution, the light shines through the anticreep holes in the disk onto the phototube beneath. This causes impulses to be transmitted to the control box, where they are amplified to control the

A new photoelectric watthour-meter testing equipment consisting of a stand having a light source mounted near the top and a phototube below. The control box at the right contains selector switches and suitable relays for controlling the potential circuit of the rotating standard.

operation of the tester. By means of selector switches and suitable relays in the box, the potential circuit of the rotating standard is closed and opened in accordance with the predetermined revolutions of the watthour meter.

In addition to testing watthour meters, the new device has many other uses. It can be used for checking the accuracy of rotating standards by the primary-standard method. In this case the rotating standard is started and stopped by the tester, but the timing is obtained by reflected-light impulses from a small mirror mounted on the pendulum of a standard clock. Again, it can be used with a rotating standard or secondary standard to start and stop meters in gang testing. An auxiliary relay is required for this type of work to carry the current to the several potential coils.

Chronograph terminals are pro-

(Continued on page 52)

Florida Power Line Truck Has "Everything"

Line crews of the Florida Power Corporation, St. Petersburg, Florida, now operate at top notch efficiency and dispatch in a fleet of "trucks that have everything."

The four new semi-trailer units that comprise the fleet provide ample space for carrying adequate materials and equipment, power units for pole setting, an enclosed compartment in the forward part of the trailer to protect the crew members from the weather when they are traveling to and from their work. Above all, these vehicles meet equally well the problems of working in a congested city or in wooded rural areas.

Requests of the crew members for some such combination of vehicle were long regarded as asking for the impossible. However, it remained for John Auer, superintendent of transportation, to work out the solution.

The fifth wheel of this tractor, semi-trailer assembly permits detaching the trailer for maximum maneuverability in congested areas. The units also operate with utmost efficiency in rural districts, where hard going is encountered. Couplings on the rear of the semi-trailer permit easy attachment of a pole carrier. The latest safety features have been embodied in the design of these vehicles throughout.

These new units are believed to be the first of their kind in this type of service in the United States. They were subjected to a number of rigorous tests and came through with flying colors. Mileage records show that operating costs are gratifyingly low.

Above, semi-trailer and pole carrier. Below, rear view of trucks and semi-trailer.

PRACTICAL HELPS for the TRADE

Contractor - Dealer - Motor Shop

Record Department Helps Lost Volume

A new phonograph record department is serving a double purpose for Prichard Radio Co., of Prichard, a suburb of Mobile, Ala. It replaced much of the lost volume in radio sales and at the same time has stimulated sales of radio-phonograph combinations of which there is still a considerable supply.

"We established the record department, which we advertise as one 'of the finest record centers in the country,' in recognition of the comeback of the phonograph," said E. M. Farber, proprietor. "People hear the hit tunes on the radio or over some juke box and they want to reproduce them in their homes". We were looking around for some line to supplement radios and found it in the record department. It has proved a big hit.

"Our record department, not only has added volume in business and store traffic, but has awakened new interest in combinations in this locality. It now appears that our dollar sales will remain the same for the present despite the shortage of radios. Fortunately, we were able to pick up an extra stock by purchasing from dealers who were going out of business."

Mr. Farber reports that business in his service department has grown immensely and this has also helped to maintain volume. He said he had enough parts on hand to last 3 to 6 months and he hoped that by that time parts will be available in the necessary quantity.

Photoelectric Cell Announces Customers

Appliance repair shops are usually noisy on account of the necessity of testing out radio, etc. The more service men at work, usually, the more noise. As a result, a customer can often come in at the front door unseen and unheard, unless a service man happens to look up.

To remedy this situation Prince Bros. Radio Service Co., Birmingham, Alabama, installed an electric eye at the front entrance. When a person enters, breaking the ray of light across the entrance, a gong sounds and three lights, suitably spaced, blink on and off. If the proprietor or service assistant does not hear the gong, he is almost certain to see the blinking lights.

Herschel M. Prince, proprietor, said the electric eye attachment cost about $25 and had been worth many times its cost. Customers are seen and waited on immediately. There are no walkouts for lack of being waited on. Incidentally, Mr. Prince mentioned, that the electric eye had eliminated thefts from the showroom as the gong also sounds and the lights flicker as the person goes out.

The photo electric cell works whether the door is open or closed and hence is better than an electrical switch operated by the door which only works when the door is being opened or closed. The warning signal is needed worse when the door is open during the summer, Mr. Prince pointed out.

This new phonograph record department, added by Prichard Radio Co., of Prichard, Alabama, is helping this firm to make up for radio sales lost because of the lack of new merchandise.

Repairing Range-Burner Porcelain Brick

Fred Stevenson, of Acme Electric Company, Miami, Fla., has a neat trick for repairing breaks in range-burner porcelain. Stevenson first soaks the porcelain in water until bubbles cease rising. This usually takes from 30 to 45 minutes. He then adds water to a readily-available crack-filling or tile cement until he has a thin mixture. This he applied to the broken surfaces, pressing the latter firmly into place and taping them into position with friction tape. The porcelain should then

be put aside, and allowed to stand until the cement has hardened thoroughly.

Thinned cement of the type Stevenson has been using requires three to four days to become completely hard. If a thick coating of undiluted cement is applied to the reverse side of the porcelain over the broken surface, and allowed to harden, the second application of cement will reinforce the first and still leave a neat-looking repair.

Efficient Fixture Cleaning Schedule

When every minute counts in securing maximum war production, the setting-up of a definite fixture cleaning schedule will be beneficial. Today's production plans, with round-the-clock plant operation in many cases, means more frequent cleanings in order to maintain the necessary high levels of illumination.

For cases where reflectors are interchangeable, the following schedule is suggested by S. H. Eaton, commercial engineer of the Hygrade Sylvania Miralume Fixture Division:

1. Man on ladder removes lamps and reflector and passes them down to man on floor who in turn passes up a reflector previously cleaned. It is not necessary to have a spare reflector for this, but simply remove the reflector from the first fixture, wash it and go on to the next, using the first reflector as a spare and coming back to replace it with the last reflector in the group.

2. Man on ladder secures clean reflector in place. Man on floor wipes off the two lamps which he passes back to man on ladder.

3. Man on ladder (should have a supply of starters in pocket) reinstalls lamps and sees that fixture is working properly.

4. Man on ladder descends and puts ladder in place at next fixture.

5. Meanwhile, man on floor washes and dries the reflector from the first fixture and has it ready to replace the soiled reflector on second fixture.

6. Repeat procedure throughout area.

It is possible to lay out a similar schedule for any floor area and by so doing cut cleaning time to a minimum.

Fluorescent Lighting for High Mounting Heights

The shop building illustrated in Figure 1 is a typical example of the use of fluorescent luminairies with two 100-watt lamps mounted 28 feet above the floor. The diagram (Figure 2) shows a typical bay layout and gives the initial footcandle values obtained three feet above the floor. It is expected that normal depreciation on this installation will be about 30 per cent.

This installation has several outstanding features. Diffused fluorescent light provides very comfortable illumination, free from direct or reflected glare. Shadows are soft, and high vertical footcandles illuminate the interior of deep cavities in electrical machinery. The light is uniformly distributed, properly illuminating areas close to walls and in corners. Crane lights are unnecessary because widespread illumination provides sufficient light beneath the crane to eliminate the usual sharp shadows. The high quality of the light gives excellent visibility for reading micrometers and gauges.

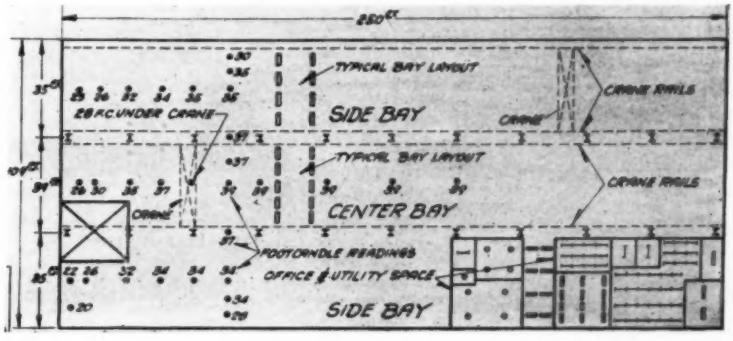
Overlapping Light Essential In Protective Installations

Overlapping light from the luminaires in an industrial protective lighting system is an all-important element in design and installation because it continues the effectiveness of the system if one of the lamps fails or is put out of commission.

This frequently neglected consideration was emphasized recently by Robert J. Swackhamer, of General Electric's Illuminating

Fig. 1. Harsh shadows are eliminated by high bay fluorescent lighting in this machine shop. The lamps are well shielded, and the ceiling is illuminated by diffuser type reflectors. (Westinghouse Photo)

Fig. 2. Illumination of 34 foot candles is provided by 228 Westinghouse wide angle diffusers with two 100-watt white fluorescent lamps in this machine shop. Luminaires are mounted 28 feet above the floor.



Laboratory, in a talk to a group of lighting salesmen.

"In a protective lighting system where the luminaires are installed 125 or 150 feet apart, they should be capable of illuminating more than that distance. Then if one of the lamps should fail, a dark area will be averted," Mr. Swackhamer explained.

"Failure of a lamp on a system where the overlapping feature has been neglected necessitates anchoring patrolling guards at the darkened area until daylight, or until the lamp can be replaced. Replacement is usually a job only for an experienced and properly equipped lineman because the series circuit power distribution systems commonly used involve relatively high voltages."

Radio Test Outfit Made from Old Set

Radio testing equipment is getting to be increasingly more expensive and harder to obtain, according to Harry Price, veteran radio repairman of Miami, Fla. From a used but workable set, he made an outfit recently which he employs as a substitute for an audio and radio frequency oscillator (combined or separate) for a-c or d-c high-voltage supply and for testing loud speakers.

The outfit also may be used for test work on amplifier and pickup of a radio-phonograph.

Price removed the radio chassis from its cabinet, and mounted the former on a shelf at the rear of his work bench. To the shelf he attached a panel in which he installed five outlets wired to the set. By plugging-in selectively with a pair of test-leads, Price uses his check-set for lining-up, for "boosting" weak signals, for testing audio circuits, for checking intermittent condensers and as a substitute in testing loud speakers.

Once such a check-set is rigged up, a radio repairman readily will find additional uses for it. Of course, the set selected for this purpose should be as "standard" as possible in respect to its construction detail. Obviously, it must have six or more tubes and an a-c transformer for high-voltage supply.

Hazards from Static Sparks Discussed

Sparks caused by charges of static electricity constitute a fire and explosion hazard in a wide variety of industries, according to the Department of Commerce.

Circular C438 just released by the National Bureau of Standards describes, partly in non-technical language, the nature and origin of such static charges.

The purpose of the circular is to give a general outline of the various ways in which manifestations of static electricity introduce appreciable hazards into many industries, and to present, in convenient form, a quantitative basis on which engineers can develop such safety measures as may be required. Various methods used for mitigating the hazard are listed and the possibilities and limitations of these methods discussed.

In the strict sense of the words "static electricity" means electricity that is standing still. Most persons are familiar with the accumulation, noticeable in dry weather, of electric charge as they walk on a rug in the house, the office or the hotel corridor and with the consequent shock and spark when the hand approaches a grounded metal object. In most cases the spark is harmless and the shock annoying only because unexpected.

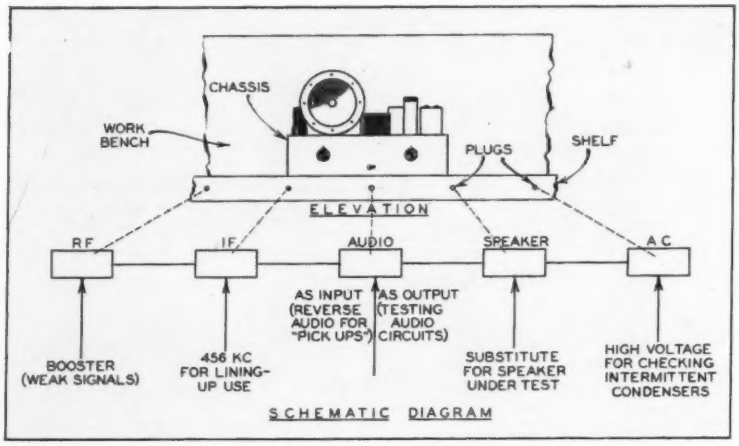
On the other hand, in industrial plants such sparks may be produced in a space which contains flammable gas or dust, and then they constitute a very serious fire and explosion hazard.

Copies of Circular C438 may be obtained from the Superintendent of Documents, Washington, D. C., at 10 cents each.

Explanation of Code Amendments

Emergency conditions resulting from the war effort have led to the adoption of a number of Interim Amendments to the 1940 Edition of the National Electrical Code. Most of these amendments have been published in the form of a supplement to the 1940 Code and are now available. The Electrical Committee of the National Fire Protection Association has decided not to issue a 1943 revised edition of the Code but will keep the 1940 edition in effect, modified by these interim amendments.

In this and following issues of ELECTRICAL SOUTH, the most important amendments will be reproduced together with a brief explanation telling why each amendment was adopted and what its effect will be on wiring installations, etc. these explanations are *not* official interpretations but have been prepared especially for readers of this magazine by various members of the International Association of Electrical Inspectors, most of them members of the "Article Committee" concerned and men who played an important part in the preparation of the amendments which they explain.



Elevation and schematic diagram of radio test device built from old standard receiving set. Various points of the old radio circuit are made available by telephone test jacks so that it can be used as a booster for weak signals, as a signal generator for lining up intermediate frequency stages, as a source of audio frequency signal, as a test speaker, or as a source of high voltage.

(A copy of the 1940 Code and the Supplement will be mailed promptly upon receipt of 15c. Address orders to this magazine Grant Building, Atlanta, Ga.)

Interim Amendment No. 48

***Section 3705. Number of Conductors in Box. Interim Amendment No. 48. Approved May 20, 1942.**

The last paragraph of sub-paragraph a of section 3705 has been amended to read:

The above tables apply where no fittings or devices such as fixture studs, hickeys, cable clamps, switches, or receptacles are contained in the box. Where *one or more* fixture studs, cable clamps or hickeys are contained in the box, the number of conductors permitted shall be one less than shown in the tables. *For each flush device or combination of flush devices mounted on the same supporting strap*, the number of conductors permitted shall be *one* less than shown in the tables. A conductor running through the box is counted as one conductor, and each conductor terminating in the box is also counted as one conductor. *Where single boxes are ganged, and each section is occupied by a flush device or combination of flush devices on the same strap, the limitation shall apply to each section individually.*

The original paragraph of this part of the National Electrical Code was so open to question that a large number of "Official Interpretations" had to be issued. For the sake of clarity and convenience, the original rule has been so worded as to satisfactorily answer all past questions on the intent of the rule.

Interim Amendment No. 49

***Section 3716. Non-Metallic Outlet Boxes. Interim Amendment No. 49. Approved June 17, 1942.**

The first sentence of section 3716 is amended to read: "Non-metallic outlet boxes may be used only with open wiring on insulators, concealed knob-and-tube work, non-metallic sheathed cable, and with non-metallic waterproof wiring, *and shall be used when such wiring systems are installed on premises where a continuous underground metallic water piping system is not available as a grounding electrode.*"

The exact intent of this amendment has received considerable discussion. One well-informed Code authority believes that the effect of this change will be to eliminate entirely the use of metallic outlet boxes on all systems "where a continuous underground metallic water piping system is not available." In practice, this would mean the elimination of metal boxes from farm wiring projects.

Interim Amendment No. 50

***Section 3466. Number of Conductors in Raceway. Interim Amendment No. 50. Approved May 20, 1942.**

Table 4 on page 305 of the code has been revised. See Table 4 under Tables in Chapter 10 of this Supplement.

This revision is based on the percentages of Table 2, of the 1940 National Electrical Code. Sizes 3 and 5 have been omitted from the table as they are not standard sizes. The revised Table 4 reproduced here includes an extension of the table into sizes and numbers of conductors not shown in the old Table 4. The revision also includes corrections to bring Table 4 into accordance with the values of Table 2.

TABLE 4—NUMBER OF CONDUCTORS IN CONDUIT OR TUBING

One to Nine Conductors Rubber-Covered—Types R, RW, RP, RH, and **RHT—600 V.

For more than nine conductors see Table 9.
(See sections 3032, 3466 and 3487)

Size of Conductor	Number of Conductors in One Conduit or Tubing								
	1	2	3	4	5	6	7	8	9
No. 18	½	½	½	½	½	½	½	½	¾
16	½	½	½	½	½	½	½	¾	¾
14	½	½	½	½	¾	¾	¾	¾	¾
12	½	½	½	¾	¾	¾	1	1	1¼
10	½	½	¾	¾	1	1	1	1¼	1¼
8	¾	¾	*¾	1	1¼	1¼	1¼	1¼	1½
6	¾	1	*1¼	1¼	1½	1½	2	2	2
4	¾	1¼	1¼	1¼	2	2	2	2	2½
3	¾	1¼	*1¼	1½	2	2	2	2½	2½
2	¾	1¼	1¼	1½	2	2	2½	2½	2½
1	¾	1½	2	2	2	2½	2½	3	3
0	1	1½	2	2	2½	2½	3	3	3
00	1	2	2	2½	2½	3	3	3	3½
000	1	2	2	2½	3	3	3	3½	3½
0000	1¼	2	2	2½	3	3	3½	3½	4
250000	1¼	2½	2½	3	3	3½	4	4	4½
300000	1½	2½	3	3	3½	3½	4	4½	4½
350000	1½	2½	3	3½	3½	4	4½	4½	5
400000	1½	3	3	3½	4	4	4½	5	5
450000	1½	3	3	3½	4	4½	5	5	6
500000	1½	3	3	3½	4	4½	5	5	6
550000	1½	3	3½	4	4½	5	6	6	6
600000	2	3	3½	4	4½	5	6	6	6
650000	2	3½	3½	4	5	5	6	6	6
700000	2	3½	3½	4½	5	6	6	6	
750000	2	3½	3½	4½	5	6	6	6	
800000	2	3½	4	4½	5	6	6		
850000	2	3½	4	4½	5	6	6		
900000	2	3½	4	4½	5	6	6		
950000	2	4	4	5	6	6			
1000000	2	4	4	5	6	6			
1250000	2½	4½	4½	6	6				
1500000	2½	4½	5	6					
1750000	3	5	5	6					
2000000	3	5	6						

Interim Amendment No. 51

***Section 3488. No Threads. Interim Amendment No. 51. Approved May 20, 1942.**

The caption and text of section 3488 revised to read:

3488. Threads. Tubing shall not be coupled together nor connected to boxes, fittings, or cabinets by means of threads in the wall of the tubing, *except by fittings approved for the purpose. Threads shall not be of standard pipe thread dimensions.*

Heretofore, electrical metallic tubing could not be threaded. This amended section allows threading but only when used with special fittings having other than standard pipe threads. The design of the connector must be such that if bending stress is put on the tubing near the thread, the bend cannot occur at the thread.

NEW ELECTRICAL BOOKS

Communication Circuits

By Lawrence A. Ware and Henry R. Reed. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City, N. Y. 287 pages, illustrated. Price, $3.50.

This textbook presents the theory of communication circuits for those interested in communication engineering, whether they are training for civilian duties or for service with any one of the various branches of the armed forces. The basic principles of communication transmission lines and their associated networks are presented, covering the frequency range from voice frequencies through the ultra high frequencies.

Particular emphasis has been applied to ultra high frequencies because of the importance of the use of microwaves in the present national emergency.

Th authors point out in the preface that an effort has been made to cover the essentials of transmission and to lead logically to such subjects as filters, impedance matching, and wave guides. A knowledge of calculus and the elements of alternating current theory on the part of the reader is assumed. More advanced mathematics is needed for certain portions of the text. However, an appendix is included which contains the basic principles of such advanced mathematics as hyperbolic functions, bessel functions, etc.

Practical Course in Electricity and Radio

By W. T. Perkins and A. Charlesby. Published by Chemical Publishing Company, Inc., 234 King Street, Brooklyn, N. Y. 312 pages, illustrated. Price, $4.00.

This is an elementary course in the fundamentals of magnetism, electricity and radio designed to provide the reader with a sound knowledge of all the underlying theory of electrical engineering and radio work.

The text is presented in a unique form. It is divided into five distinct sections, each of which includes an outline of fundamental principles followed by a series of experiments showing the practical application of these fundamentals. Full details are given to enable the student to carry out the experiments as well as information on the method to be employed in working out results and making final deductions.

The combination of fundamental theory with practical experiment provides an ideal introduction to these electrical engineering and radio fundamentals.

Ultra High Frequency Techniques

By J. G. Brainerd, Glenn Koehler, Herbert J. Reich, and L. F. Woodruff. Published by D. Van Nostrand Company, Inc., 250 Fourth Ave., New York, N. Y. 570 pages, illustrated. Price, $4.50.

The growing need for engineers and physicists with training in the ultra high frequency field led to the preparation of this text by four outstanding electrical engineering authorities. Despite the fact that the book is the result of war pressure, it covers no specific military material and will prove quite as useful in the study of peace-time applications of ultra high frequency circuits and equipment.

The book begins with a brief review of the elements of circuit theory and electron tubes. Thereafter, it presents in unified manner the material required as the minimum basis for technical work in the ultra high frequency field.

The general level of the text is that of senior students in electrical

(*Continued on age 50*)

Predetermining Rotor Direction of Rotation

*By A. C. Roe**

WHEN REPAIRING or rewinding the stators of single-phase motors of the split-phase type, that have a starting and running winding, it is desirable in many cases to pre-determine the direction of rotation of the rotor, before making permanent internal winding connections.

Generally the standard direction of rotation is counter-clockwise (CCW) facing the front end of the motor, the front end being opposite to the end from which the shaft extends. From this the connection end of the winding must be marked as a guide during rewinding and assembling.

There is one simple principle that determines the direction of rotation of the rotor in split-phase windings, and that is, "the rotor will turn from a starting coil toward a running coil of the same magnetic polarity."

The reason for this is that when the windings are connected to the line, the current in the starting coil reaches its maximum a short time before the current in the running coil attains its maximum, which means that the shifting or revolving magnetic field, produced by the combined running and starting coils travels from a starting coil to the running coil of the same polarity. Thus the rotor is pulled around in the same direction as the magnetic pole travel.

A simple rotation tester can be made as shown in Figure 1 which consists of two round fiber or micarta end plates with eight holes drilled on the outer face. The holes should be drilled to permit part of the copper wire bars to protrude above the face of the end plates. Number 20 copper wire is then run on over the wire rods at each end and the turns are soldered to the wire rods and to one another. A small pin can be driven through the No. 20 wire band into the end washers to prevent slipping.

To check rotation, connect winding, and make temporary connections between running and starting windings, connect stator to reduced voltage of proper frequency, and insert dummy rotor. The rotor will turn according to connection made, and the starting winding leads can be interchanged to correct rotation if required.

A compass and d-c line voltage can be used to predetermine rotation by first connecting all running and starting coil groups, and then connecting a running and starting winding lead together, leaving the other two leads open. Next, attach a d-c test lead at reduced voltage to the two winding leads, and then attach the other d-c test lead to the open lead from the starting winding. Check with the compass to locate a north pole group and mark it. Next move the d-c lead from the single starting winding lead to the single running winding lead. Check again with the compass. The polarity of the adjacent running coil in the *direction of rotation desired* should be the same as that of the starting coil just found.

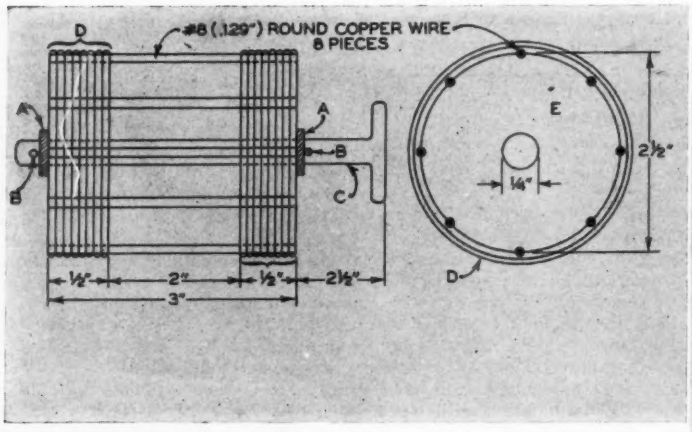
If the running coil group has the wrong polarity, interchange the running winding leads and make the compass check again.

If the "all-in-arrow" check is used when connecting the pole groups of each winding in series, then the proper starting and running winding leads can be connected together for any rotational direction required. For example, Figure 2 shows the starting coils in inner circle for a typical winding, with the current flowing in at the left of the group 4S, and in on the left of running coil group 4R.

With the connection shown in Figure 2, the rotor will run from 1S to 1R or counter-clockwise. For clockwise rotation, the arrows on 1S-2S-3S-4S must be reversed so that the rotor will turn from 1S to 4R. Then with this check, it will be found that interchanging leads 1S and 2S at their junction with 1R and 2R will provide the proper relations.

Thus rotor rotation on single-phase, split-phase motors is a function of proper connection of the starting winding leads to the leads of the running winding, and one simple rule governs this relation.

*Mr. Roe is motor engineer for Westinghouse Electric and Manufacturing Company.



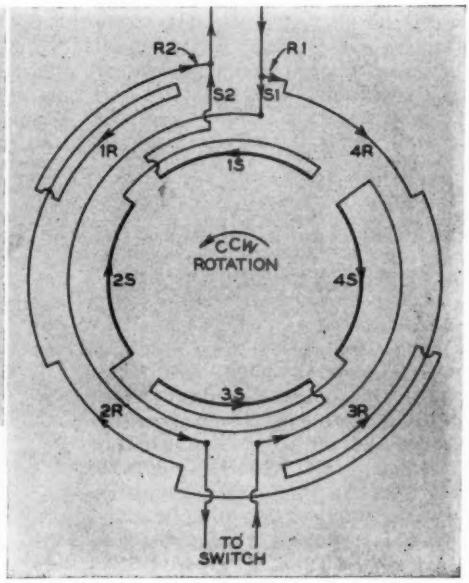


Fig. 1. (Above) This rotation tester consists of fiber or micarta end plates with a "squirrel cage" of copper wire bars. The rods are electrically connected at each end by wrapping on No. 20 bare copper wire. A=washer; B=collar pin; C=¼ inch shaft; D=No. 20 wire wound on ends and soldered; E=fiber end plates. Fig. 2. (Right) Typical winding discussed in text.

NEWS of the INDUSTRY
National and Southern

Dallas Power & Light Celebrates 25th Year

In observing it's 25th anniversary of public service and good citizenship in Dallas, the Dallas Power & Light Company, recently honored twenty-six of its veteran employees at a dinner held at the Baker Hotel. More than 6600 employees attended and 100 of the city's civic and business leaders. The employees who were honored have served the Dallas Power & Light Company or its predecessors 25 years or more. The oldest employee in the point of service, now retired, has a record of 53 years.

The feature of the celebration dinner was a "Cavalcade of the Dallas Power & Light Company." WFAA-KGKO talent was used to portray the activities and growth of the company and the city since the Dallas Power & Light Company was organized in 1917.

G. L. MacGregor, president of the company, made this an occasion to announce a "Service Opportunity Program" in which all the employees will participate in telling and showing customers of the Dallas Power & Light Comany how to maintain their appliances and keep them in good working order for the duration.

The principal speaker was Col. Julien C. Hyer, of the Army's Eighth Service Command.

The past month has been one of activity for the Dallas Power and Light Company in observing its 25th anniversary. Newspaper advertisements, outdoor advertising, truck cards, window displays and other media were utilized to call to the attention of the people of Dallas that the power company had been with them for a quarter of a century.

A contest was held to determine who held the oldest Dallas electric bill. A $25 war bond was awarded to the winner.

Happenny Heads Utility Association in Oklahoma

J. C. Happenny, president, Oklahoma Power and Water Co., of Sand Springs, Okla., was elected president of the Oklahoma Utilities Association for 1943, at a recent meeting of the board of directors of the organization at Tulsa.

Other officers elected for the succeeding year were: E. C. Joullian, resident, Consolidated Gas Utilities Corp., Oklahoma City, first vice-president; George McLean, Oklahoma Gas and Electric Co., Oklahoma City, second vice president; D. S. Kennedy, same company, treasurer; and Miss Kate A. Niblack, Oklahoma City, secretary.

Members of the board of directors elected were: Glenn C. Kiley, Oklahoma Gas and Electric Co., Oklahoma City; Frank B. Loug, Oklahoma Natural Gas Co., Tulsa; R. K. Lane and J. P. Arnold, both of Public Service Company of Oklahoma, Tulsa; C. A. Breitung, Southwest Natural Gas Co., Ada; George A. Davis, Oklahoma Gas and Electric Co., Oklahoma City; and J. C. Happenny.

Directors who held over are: E. C. Joullian; A. F. Porter, The Gas Service Co., Bartlesville; S. I. McElhoes, Southwestern Light and Power Co., Chickasha; and W. L. Woodward, Zenith Gas System, Inc., Alva.

Abandonment of Conventions Urged By ODT Official

Abandonment of meetings and conventions that will not contribute in an important way to winning of the war was urged today by Joseph P. Eastman, Director of Defense Transportation.

Responding to requests for the attitude of the Office of Defense Transportation on the holding of conventions involving intercity travel, Mr. Eastman said in a formal statement that individual associations must make their own decisions. He indicated, however, that no such gatherings would be justified, in view of war burdens on the transportation system, unless they would help to shorten the war.

Mr. Eastman pointed out that expanding production, larger troop movements and a rising volume of travel on war business would subject the already heavily burdened transportation lines to heavier strains in 1943. Railroads and bus lines, he said, "will have extremely limited facilities in 1943 for passengers not in the armed services or not on business of an essential or emergency character."

The ODT Director declared that "every convention or meeting cancelled, even if it would have involved

G. S. Becker, left, receives a 25-year service award from G. L. MacGregor, president, Dallas Power & Light Company, at the company's 25th Anniversary dinner held recently. Twenty-six other veteran employees of the company were presented with service awards.

travel by only a comparatively small number of persons, will mean a decidedly worthwhile saving of transportation facilities and will itself constitute a contribution to the war effort."

NEMA Sets Up New Lighting Equipment Group

The problems of better lighting in both manufacturing and service industries to meet wartime demands for increased production, improved products and greater safety and comfort for workers will be studied by the newly organized Industrial and Commercial Lighting Equipment Section, of the National Electrical Manufacturers Association, according to an announcement by its chairman, E. C. Huerkamp, manager, Lighting Sales, Westinghouse Electric & Mfg. Co., Cleveland, O.

"By combining the two NEMA Sections dealing with industrial and commercial lighting equipment into the new section, we hope to develop ways and means of making the 'lighting tool' more easily available and thus provide a better service to industry and the war production effort," Mr. Huerkamp declared. "The realization that good lighting is an industry tool is being increasingly recognized by industry. Through the new NEMA Section, and the work of its several Committees, we will deal as a representative industry group with every phase of good lighting practice. It is our purpose to lend all possible assistance to the war effort and post-war planning in these fields."

A. F. Wakefield, vice president, The F. W. Wakefield Brass Co., is vice chairman of the NEMA Section and Frank J. Martin, of NEMA, is the recording secretary.

Sharp Construction Decline Predicted

New construction activity in the continental United States is expected to decline to approximately $7.3 billion in 1943 as compared with a preliminary estimate of $14 billion in 1942, secretary of labor, Frances Perkins reported recently.

"Private construction is expected to drop from an estimated $3.4 billion in 1942 to about $1.4 billion in 1943," she said. "Construction financed from public funds, although not expected to decline so sharply, is forecast at $5.9 billion in 1943 as compared with $10.6 billion in 1942.

"The necessity for conserving critical materials and a shortage of manpower in 1943 will probably hold private construction down to the barest essentials. Nonfarm residential construction, which will be restricted to low cost units in war industrial areas, will probably not exceed $680 million. Private nonresidential construction will consist largely of war industrial plants and the total will not be much over $100 million. Total farm construction is expected to amount to about $370 million in 1943. It is anticipated that public utility construction will feel the pinch in critical materials and will be limited to plants absolutely necessary to the maintenance of essential civilian services.

"Direct military and naval construction and war-industrial facilities will account for about 70 percent of all construction expenditures in 1943. The industrial facilities program, which should be almost completed by the end of 1943, will total approximately $1.3 billion as against $3.5 billion in 1942. Military and naval construction expenditures are not expected to exceed $2.9 billion in 1943, a decline of 47 percent from 1942.

"Scheduled construction on the war public housing program indicates that the value of work to be put in place in 1943 will total about $600 million. This exceeds the 1942 figure by $72 million. Public nonresidential construction which includes the schools, hospitals, and recreation centers financed from war public works funds is expected to increase from $134 million in 1942 to approximately $150 million in 1943. Construction of access roads, strategic highways, and flight strips, will hold highway construction up to about $500 million as compared with $659 million in 1942. Other public construction, including river, harbor, and flood control works, T. V. A. projects, and public service enterprises such as water and sewage, rapid transit, electric light and power, and pipe lines will probably not exceed $450 million."

No. 6 Weatherproof Wire Approved for Housing Standards

Effective immediately, the Housing Utility Standards have been amended to permit the use of No. 6 weatherproof copper wire for all purposes for which No. 8 copper wire is now specified in the Housing Utility Standards, as amended August 25, 1942, provided that such No. 6 weatherproof wire is obtained from excess stocks either of applicant or of another utility, Herbert S. Marks, acting director, Power Division, W. P. B. announced recently.

This amendment is being issued because of the existence of substantial quantities of No. 6 weatherproof wire in utilities' stocks and because of the impracticability of redrawing such weatherproof wire to No. 8 size or of scrapping such wire.

Motor Repair Men To Discuss Problems

A national war conference on maintenance and repair of electrical equipment is being called by the National Industrial Service Association, Inc., at the Netherland Plaza Hotel, Cincinnati, Ohio, on January 26 and 27, 1943. Everyone interested is invited to attend. Discussion will center about the solution of the material and manpower crisis.

There will be one business session on the morning of the first day and the afternoon will be devoted to "Priorities and Material Procurement Problems," followed by a get-together dinner. The second morning session will be given over entirely to manpower problems and this, of course, includes woman power. The fourth and last session on the afternoon of February 18th will be a general session given over to a discussion of the application of the new Motor Limitation Order No. L-221, Certified Repair Plan, accounting and tax service for motor repair shops, and the effect of the war on shop practices.

Someone from the WPB, probably D. M. Crim, will explain how the new Controlled Materials Plan affects the motor repair shops and what they have to do to meet its requirements. J. W. Mullally, of the Copper Division, WPB, has been invited to tell the repair industry something of his difficulties in getting copper for them and the type of cooperation that he must have in return. Then it is planned that these Government experts will answer all the questions that the repair shop operators can fire at them.

An official from the Manpower Commission will tell of its requirements, explain Manning Tables and Replacement Schedule, and tell the industry what the Manpower Commission will require of it in the months to come. Because it has been necessary to employ so many unskilled men and women, there is a need for some simple aptitude tests to assist in the selection of these employees and such tests will be presented to the conference. After the employees are hired, they must still be taught their jobs, so the training-within-industry technique will also be presented. The biggest employment problem is bringing women into the shops. A survey of this subject is being made and the results will be made available for discussion at the conference.

There will be no exhibits, no entertainment, and no loss of time at this conference. It is scheduled in the middle of the week when travelling is normally easier than on week-ends. Nevertheless the railroads recommend that tickets be purchased both ways a month in advance.

Crosley Distributors Hear Post-War Plans

The Crosley Corporation is actively planning its post-war program in radio and major appliance distribution. In order to keep its distribution informed and, at the same time, consult with its peacetime distribution, a series of meetings are being held around the country.

The first of these meetings was held in Washington, D. C., on October 23rd at which time R. C. Cosgrove, vice president and general manager of The Crosley Corporation, headed a group of company officials at an all-day meeting in the Willard Hotel.

Vice-president Cosgrove told the assembled Crosley distributors of the rapid and extensive expansion of the company's plant facilities, its engineering and other technical personnel, and its forces of skilled workers to meet the requirements of its all-out war production program.

"Distributors of Crosley products will benefit greatly from these greatly increased facilities and our expanded technical personnel, when peace comes, and our post-war plans can be put into effect," Mr. Cosgrove said.

Despite difficulties attendant upon a complete conversion of all of its facilities from peace products to war munitions, Mr. Cosgrove told the distributors that Crosley's volume of business in 1942 would be approximately twice that of 1941, and that an even greater increase is scheduled for 1943.

He outlined briefly the company's plant modernization program, including the erection of extensive new plant additions and the purchase outright of a complete tool and die concern.

J. H. Rasmussen, manager of radio, appliances and automotive division, told the Crosley distributors of the company's post-war planning activities and the work that his department already has under way. He pointed out that Crosley's engineering staff is now six times as large as it was before its war production operations were started.

"Because of our new plants, new equipment facilities and our greatly expanded trained personnel in production, inspection and other departments, Crosley will be prepared to produce a much larger quantity and a more varied line of radio receivers, appliances and automobiles, when we have won the war," he declared.

Ben T. Roe, Crosley manager of distribution, told the conference what various Crosley distributors have done to hold up their volume in wartime and made a number of suggestions regarding new lines of merchandise which his division has helped to make available to distributors.

J. S. Crossin, manager of Crosley's Washington office and formerly manager of the company's refrigeration division, discussed the part that the Washington office is playing in the war effort.

Frank H. McIntosh, chief of the civilian radio section, and Glenn C. Harvey, administrator, both of the War Production Board, discussed the board's radio program and told what is being done to assist in keeping replacement parts reaching dealers and consumers constantly.

Officials of The Crosley Corporation are shown here in session with some of the corporation's Eastern distributors, and several government officials. The meeting, held at the Willard Hotel, Washington, D. C., gave distributors an opportunity to hear Crosley's post-war plans as well as to discuss service and parts problems.

Service Organizations Must Keep Records

Proprietors of all businesses which come under the Services Regulation are required to preserve current records under terms of an amendment issued today by the Office of Price Administration.

The Amendment, No. 10 to Maximum Price Regulation No. 165 as amended, is effective December 3. It requires the sellers to preserve after the effective date of the amendment records of the same kind as they customarily keep, thus providing OPA with records without increasing the bookkeeping burdens of the sellers. Sellers of services, which are already under the General Maximum Price Regulation, are already obligated to preserve their current records by that regulation.

Under terms of the amendment, sellers of services which at some future time are brought under the regulation will be required to preserve their records after the effective date of the amendment bringing them under the regulation.

The amendment also provides that sellers of services brought under the regulation for the first time are given 20 days for preparation of statements of ceiling prices and another 10 days for filing these prices.

In case of a new service not sold in March, 1942, the statement of ceiling prices must be prepared within 10 days and filed within 20 days after the first sale of the new service —but in no case earlier than 20 days from the effective date of the amendment covering the service for the first time.

The new amendment also makes clear that all reports of maximum prices required to be kept and filed under the services regulation must be signed by the seller.

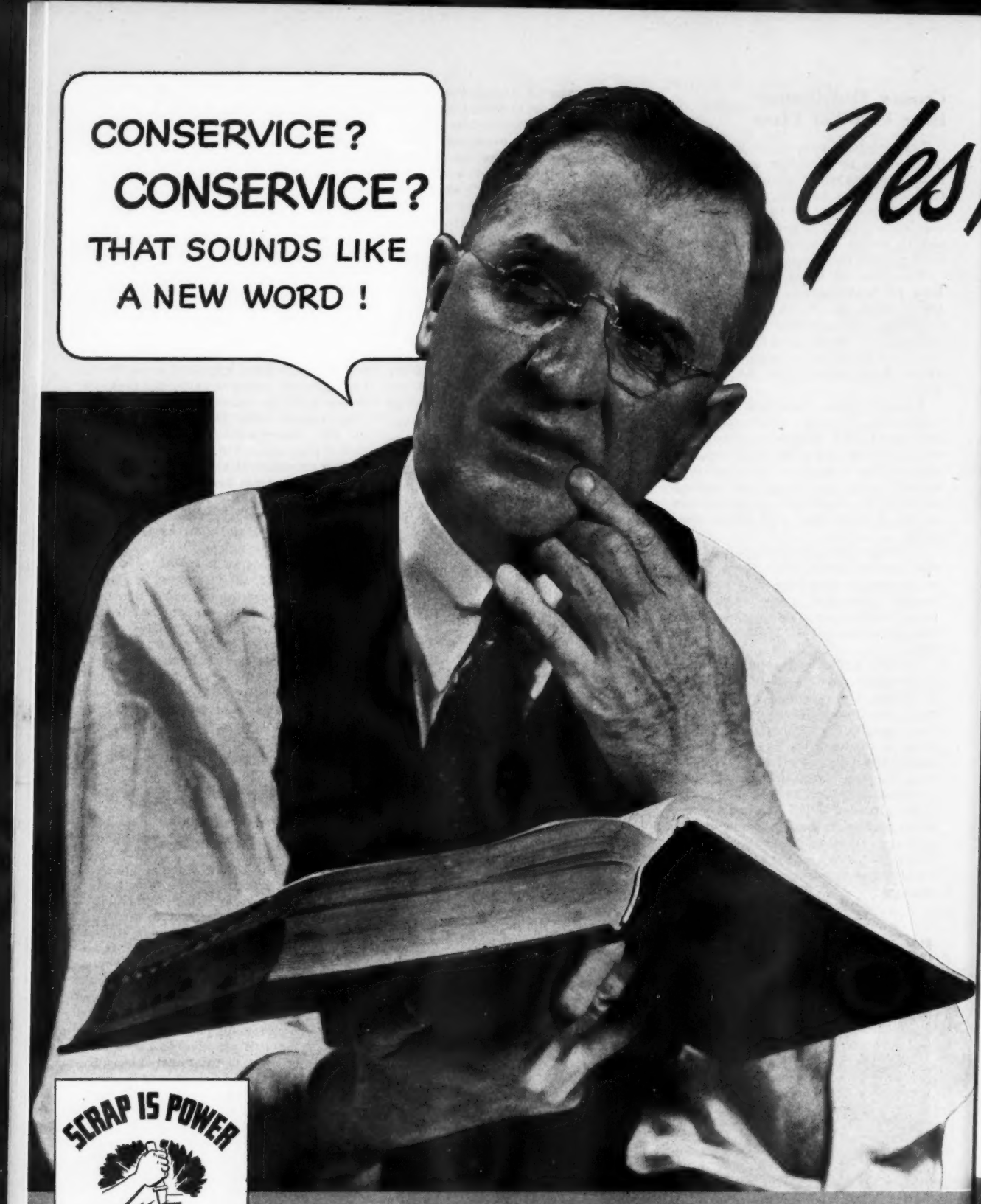
Motor Conservation Provisions Announced

A purchaser of an electric motor must show that the horse power of the motor he is applying for is no greater than that required to do the job, according to a provision in General Conservation Order L-221, announced today by the Director General for Operations, of the War Production Board.

Officials of the General Industrial Equipment Division pointed out that it has been the practice of industry for many years to "over-motor," that is, to apply greater motor capacity than necessary for the job to be done. As a means of stopping this practice, the order applies certain measurements by which the actual power requirements may be related to the horse power of the motor applied for by the purchaser.

L-221 prohibits the delivery or acceptance of motors, unless they comply with certain standard specifications and are of the simplest practicable, mechanical and electrical design. It also requires the purchaser

(Continued on page 38)


CONSERVICE?
CONSERVICE?
THAT SOUNDS LIKE
A NEW WORD!
Yes,
SCRAP IS POWER
you help.. THE WAR EFFORT
.. YOUR CUSTOMERS AND YOURSELF
... when you salvage, in accordance with your manufacturer's instructions, all inoperative parts containing...
CRITICAL MATERIALS
Cooperate with Your Industry!
Put Vitally Needed Scrap Back into The Scrap
today!
Westinghouse

"CONSERVICE" IS A NEW WORD!

It sums up the broadened conservation and service program now being operated by Westinghouse and its retailers

Conservation . . . Service . . . these two critical words have been telescoped into *Conservice*—a new term for a new kind of helpfulness to appliance users.

Here is what this Conservice program is designed to do:

1. Educate your customers in the proper "care and use" and thus—
   . . lengthen the life of appliances
   . . prevent needless service calls
2. Promote conservation of renewal parts—
   . . by showing your servicemen how to repair old parts
   . . by reoperating at the factory the used parts which you return, thus conserving critical materials
3. Help you provide quality service—
   . . by informing and training your servicemen
   . . by providing renewal parts

In order that your entire service department, especially the newcomers, shall be primed on every phase of this new Conservice program, Westinghouse is launching a series of Conservice Training Schools. Both in scope and character, we believe they will go far beyond anything ever before offered by a manufacturer of electric appliances.

While doing everything in our power to keep a steady supply of renewal parts flowing to you, we are at the same time giving you the kind of practical assistance that will help you solve your man power and service problems.

WESTINGHOUSE ELECTRIC APPLIANCE DIVISION
MANSFIELD, OHIO

Coming your way!

A COMPLETELY EQUIPPED CONSERVICE TRAINING SCHOOL

Hundreds to be conducted during 1943

Here's a course of instruction made to order for the times. One part of it is planned especially for the newer men and women who will be servicing appliances during the coming months.

With dramatic films, illustrated manuals, simple discussions and demonstrations, the service person receives training completely covering the servicing of Westinghouse appliances and the conservation of renewal parts.

Your Westinghouse distributor will notify you as soon as the date is set for the Conservice Training School in your territory.

Copyright 1943, Westinghouse Electric & Mfg. Co.

Tune in John Charles Thomas, Westinghouse Radio Program, NBC, Sunday 2:30 P.M., Eastern War Time

WESTINGHOUSE

Electric Home Appliances

(*Continued from page 35*)

to certify and show reason why he must have a motor of a special type; and it restricts the use of such special types to the conditions and the purposes for which they are required. For example, it limits the use of explosive proof motors to hazardous locations.

One of the important conservation provisions in the order applies to both motors and generators. It requires the applicant to certify that he has made every reasonabble effort (1) to adopt idle motors or generators in his possession, (2) to obtain used ones for his purpose, and (3) to repair or recondition his existing equipment.

Where used equqipment cannot be secured within a reasonable time by the applicant, it is suggested that he make his needs known to WPB's Surplus Used Equipment Branch, which will assist him in meeting them.

It is estimated that the conservation and simplification provisions in the order will save in one year about 15,000,000 pounds of copper, 55,000 tons of carbon steel and 150,000 pounds of stainless steel.

Kelvinator Refrigerator Service Training Course

Recognizing the important current need to train thousands of new emergency refrigeration-service men to meet the impending manpower shortage crisis with which the refrigeration industry is faced, the Kelvinator Division of Nash-Kelvinator Corporation has compiled a new manual designed to provide dealers with a simplified means of efficiently training the many people who will be needed to keep the nation's refrigerators going for the duration.

Called "Simplified Training Course for Refrigerator Service Men," the new book is being made available this month to all appliance retailers throughout the country as Kelvinator's contribution toward stimulating the training of new personnel.

"Simplified Training Course for Refrigeration Service Men" is written from an industry-wide standpoint rather than from a Kelvinator standpoint alone, and as such covers service on electric refrigerators in general rather than service only on the company's own products.

Created principally for training people who have had little or no experience servicing electric refrigrators, the manual is written in such a way that men who are more used to working with their hands than with books can easily grasp its contents. It is simply-written, highly pictorial and short, reflecting the company's practice of providing retailer helps written on the basis of practicability and usability in the field.

The manual is pocket-size and treats in detail twelve broad subjects covering theory as well as service procedure. The twlve subjects are:

1. Principles of Refrigeration
2. Theory of Refrigeration
3. Refrigerants
4. Compressors
5. Condensers and Liquid Receivers
6. Float Valves
7. Expansion Valves
8. Temperature Controls
9. Motors
10. Installation Procedure
11. Sealed Unit Systems
12. Household Cabinets

Because of the wide circulation expected to result from Kelvinator's policy of making the service book available to all appliance retailers and because the book covers service on all types of electric refrigerators, the company hopes the manual will be an important contribution in the battle to keep America's refrigerators operating for the duration.

In addition to this manual, Kelvinator is also providing a thumb-indexed book called "Trouble-Shooter's Guide" to help service men quickly diagnose refrigerator troubles. This book shows what should be looked for first when any given sympton is encountered and how troubles can be corrected.

The symptoms are divided into two categories—those dealing with the cabinet and those dealing with the system.

Those listed under troubles dealing with the cabinet include: cabinet noisy; evaporator collects too much frost; condensation in cabinet; odor in cabinet; vegetables will not keep, meat will not keep; cabinet light does not light; shelves discolored; porcelain chipped, and finish marred.

Those listed under troubles dealing with the system include: too warm; cabinet too cold; unit won't run—open type unit; unit won't run—sealed type unit; unit noisy; unit short cycles; unit runs too much—normal or less refrigeration; and unit runs all the time—little or no refrigeration.

For public utilities, dealer associations and others interested in setting up classes for the training of refrigerator service people, Kelvinator is providing in addition a 48-page instructor's manual.

"Plan of Action" Manual Given Premier Dealers

Available at no cost to dealers is a new manual that outlines a procedure for organizing a successful service business and tells how to develop it in profitable volume. This "Plan of Action"—as developed—doesn't contain any magic formula; just a simple, common-sense plan that is based on the actual experience of appliance dealers all over the country. The principles laid down will help in servicing and promoting the reconditioning of other appliances also. The manual thoroughly covers the tools and equipment needed as well as how they're used in actual service operations.

In addition, the most essential part of Premier's Plan of Action describes the business-builders that have proved most successful in creating demand for dependable, guaranteed service at a fair price and profit. Write Premier Division, Electric Vacuum Cleaner Co., Inc., Cleveland, Ohio for your free copy of the "Plan of Action"—the easy-to-read, easy-to-understand manual that will help you get going and keep you going in service, your new business for the duration.

U. S. Steel Corporation Reviews 1942 Activities

"United States Steel Corp. is engaged in the greatest plant expansion project in its history, costing more than $700,000,000." Irving S. Olds, chairman of the board of directors, U. S. Steel Corp., reports in a statement reviewing accomplishments of the Corporation and subsidiary companies during the first year of the war.

New steel producing or finishing units near Pittsburgh, Chicago, Cleveland, Birmingham, Duluth, Worcester, Mass., Provo, Utah, and on the West coast are being pushed to completion night and day by thousands of workers. Most of these units will go into production during the first half of 1943. A large part of the new facilities is being erected by United States Steel for the account and at the expense of the government. For the remainder, the Corporation is using its own funds.

Reviewing the Corporation's production figures, Mr. Olds stated that more than a thousand new production records have been established since Pearl Harbor by U. S. Steel subsidiaries. As instances of outstanding performances the U. S. Steel chairman cited the delivery of 24 destroyers, two cruisers and many merchant ships, tankers and auxiliary vessels; the invention and production of portable steel runways for airplanes; and accelerated method of spinning bomb casings; completion in four months of 550 miles of pipe for the war emergency oil pipe line; and the production in one week by a single subsidiary of a quantity of steel plates in excess of the amount required for the building of 7,000 Gen. Grant tanks.

Tennessee Chapter of NISA Organized at Nashville

Representatives of Tennessee motor rewinding shops and others of the electrical service industry met in the Andrew Jackson Hotel, Nashville, Tennessee, recently to form a Tennessee Chapter of the National Industrial Service Association.

In attendance, to assist in the organization of the new chapter, were A. L. Brown, of Worcester,, Mass., president of the National Industrial Service Association, and Stewart N. Clarkson, executive secretary of the Association.

Officers of the new Tennessee Chapter of NISA selected for 1943 are as follows: chairman, H. E. Grant, Tennessee Electric Motor Service, Nashville; vice-chairman, L. H. Lanahan, Tri-State Armature & Electrical Works, Memphis; secretary-treasurer, A. F. Anderson,, Anderson's, Inc., Nashville; and recording secretary, J. F. Steffner, Chattanooga Armature Works, Chattanooga.

In addition to the officers, the Board of Directors will include Earl E. Wright, Dixie Armature Works, Chattanooga; and W. G. Hoffman, Tennessee Armature & Electric Co., Knoxville. Mr. Steffner will also serve as chairman of the member relations committee; and Mr. Hoffman will serve as chairman of the employees' relations committee.

Coast-to-Coast Range Service Meetings Scheduled

Having learned during 1942 that coast-to-coast service training meetings are one of the best methods by which a manufacturer and distributor can assist servicing dealers in their job of keeping appliances working for the duration, General Electric Company's Appliance & Merchandise Department and its distributors will start the year 1943 with a concentrated coast-to-coast series of training meetings devoted principally to the servicing of electric ranges and water heaters. Other products have been covered in previous meetings.

W. C. Noll, manager of the G.E. product service division, Bridgeport, Conn., announces that the range meetings will combine all of the features which servicing dealers found most desirable during the hundreds of training meetings held during similar series in 1942. The forthcoming series of meetings will cover, in addition to ranges and water heaters, a digest of repair information on small appliances, a review of refrigerator and laundry equipment, and round table discussion between servicing dealers and G.E. distributors and headquarters field men.

One of the highlights of the range training meetings will be the showing of a new full color movie entitled "Don't Blame It On The Oven". Reason for the movie is that a large percentage of range complaints can be traced to the housewife's lack of knowledge of a few fundamental facts . . . how baking is affected by the way in which ingredients are measured and mixed . . . how the color of baking pans help to determine the color of baked goods (a dark pan will make a cake too dark) . . . how proper filling of utensils helps prevent spill over and shrinking.

Another feature of the range training meetings will be a sound slide film entitled "Heating Unit Service", which gives visually the answers to surface unit and thrift cooker problems. Booklets will be distributed to the service men showing in picture form the lessons depicted in both films. The booklet which goes with the color movie "Don't Blame It On The Oven" will be in color so that baking faults may be easily identified.

A third feature of the range meetings will be the showing of a series of slides entitled "Heating Device Repairs". This will be the first time that such information has been available in visual form.

Repair parts information, 1943 service plans, and specialized information for the particular service problems of the area in which the meeting is being conducted will also be on the program.

Universal Plant Employees Hold Production Rally

Employees of Landers, Frary & Clark were spurred on to greater efficiency in the production of their prime war contract recently when a huge rally was staged at the Universal plants in New Britain, Conn.

With months of hard work behind them, employees of Landers, Frary & Clark, many of them who once had a hand in the production of the well-known Universal electrical and hardware equipment, gathered in the newly equipped cafeteria of the lower plant and the yard of the Main plant to see the fruits of their labor displayed and discussed by the management.

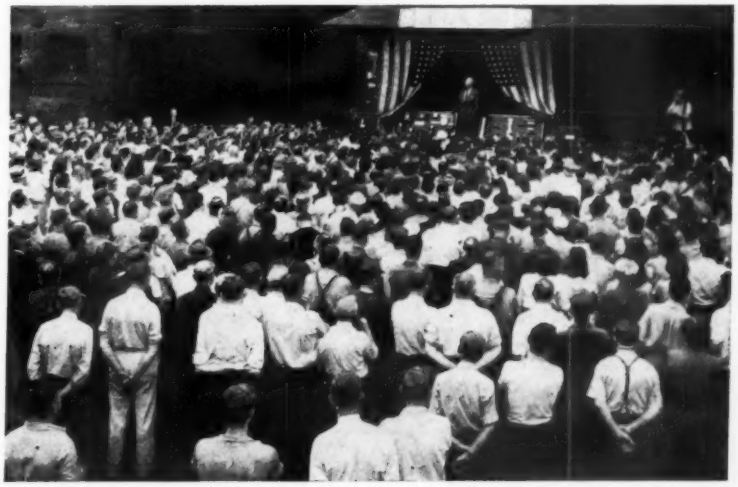
Arthur E. Allen, chairman of the board of directors, who is personally supervising the production of the prime war contract at the Lower plant, outlined the problem of converting a plant designed for the manufacture of electric ranges and washing machines to one for an entirely new weapon of war. Mr. Allen stressed that production would depend very much upon the workers themselves and the best efforts of every man and woman would be necessary for this important contributions to the war effort.

Richard L. White, president of Landers, Frary & Clark are working on war products for nearly every branch of the service, including the British government.

40,000 Vacuum Cleaners Unfrozen By WPB

Release of an additional 40,000 domestic vacuum cleaners frozen in the hands of manufacturers and private brand sellers since October 24 was announced today by the Consumers' Durable Goods Division.

The cleaners, which now become available for sale to the general public, are in addition to those released from stocks of retailers and wholesale distributors on November 21. They were unfrozen through favorable action on a number of appeals from provisions of Order L-18-c, which imposed the original sales and delivery restrictions. Both tank and brush type cleaners are included.



U. S. Aluminum Output Exceeds Nazis in '42

The United States, in 1942, produced aluminum at a rate greater than all of the Nazi-fied Europe; it is producing, probably, eight times as much of the vital warplane metal as Japan. In the year we are now entering, we should reach in this country a peak which the entire Axis aluminum production cannot hope to achieve, Roy A. Hunt, president of Aluminum Co. of America reports in a year-end statement.

With Alcoa's $250,000,000 expansion nearing completion during 1942 and with other privately-owned and government-financed plants in operation, the United States produced during the year more than a billion pounds of aluminum. When the plants Alcoa is building for the Defense Plant Corporation are completed and the peak of 1943 production is reached, there will be a capacity in this country to make 2,100,000,000 pounds annually. This is 63 per cent more than the aluminum production of the whole world in 1938. Of this total, Alcoa is scheduled to produce a major portion in its own plants and those it will lease from the government.

Expansion of fabricating facilities is keeping pace. Alcoa forging output is now 25 times what it was before the war. Production of castings has been multiplied eleven times; extruded shapes and tubing, nine times. One sheet mill alone is turning out monthly one and one-half times as much high strength alloy sheet, the kind used in warplanes, as the entire nation used in a whole year before the war.

Coal Heating Stoves Available to Dealers

A unique rationing program which aims to encourage rather than restrict buying, has been planned by the Fuel Rationing Division of the Office of Price Administration to facilitate the selective distribution of a large number of coal heating stoves. A large quantity of fuel oil will be conserved for essential war purposes through the substitution of these coal heating stoves for heaters which are oil-fired.

Recognizing the desirability of making available heating stoves using coal as a fuel, the War Production Board is taking the following steps to provide for the production of substantial quantities of these units:

1. The weight and quantity restrictions on coal heaters under Order L-23-c have been completely lifted until January 31, 1943 and the manufacturers' iron and steel quotas have been increased fifty percent for the months of February and March, 1943.

2. Several thousand of the magazine type Army No. 1 heater, already manufactured for Army account, have been released for civilian use.

3. The War Production Board has also released additional stock piles of materials for the Army No. 1 heater, as well as several months productive capacity in the plants working under Army heater contracts.

This program is of particular interest to all dealers handling heating stoves because its success will largely depend upon their cooperation in making certain that these heating stoves are available to those customers who need them and who are qualified to purchase them under the Regulations which the Office of Price Administration has promulgated.

The Emergency Heating Stove Rationing Program will be formalized in Ration Order No. 9 and will become effective at 12:01 a. m. on Friday, December 18, 1942. Under its provisions, the retail sale of both new coal-fired heating stoves and new oil-fired heating stoves, except to the Army, Navy, Marine Corps, and Maritime Commission, will be restricted to those consumers who have been granted a certificate of purchase by their local War Price and Rationing Boards. This Ration Order, which is effective throughout the area in which fuel oil is now rationed, applies only to new heating units and does not affect the sale of cooking appliances.

Youngstown Washington Offices in New Location

Washington offices of the Youngstown Steel Products Co., representing the Youngstown Sheet and Tube Company, of Youngstown, Ohio, have been moved to 615 Bowen Building, 815 15th Street, N. W., according to announcement by W. E. Watson, vice president.

Copper Circuit Design Simplified By Rule

A handy calculator that works like a slide rule has been prepared by the General Electric Company to show at a glance how much copper can be saved in a war-plant electric power system by installing unit substations at the centers of the load areas. Designated GES-3043, it may be obtained free on request to the Company at Schenectady, New York.

The rule uses a 1000-kva. 4160/480-volt unit substation as a basis, and shows the amount of secondary-cable copper that is needlessly wasted when the unit substation is at varying distances from the load center. Thus, it shows that about 12,700 lb of copper are wasted when the substation is 1000 feet away, and how it can all be saved by moving the unit substation right up to the load center.

The reverse side of the rule carries a chart showing the per cent increase in cable copper as the voltage is decreased, and another chart giving the cable copper needed to carry a 1000-kva load at various voltages over distances from 10 to 1000 feet.

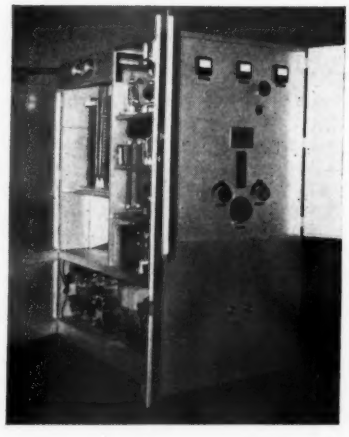
High-Frequency Equipment Facilities Expanded by Girdler

As the result of widespread interest and new wartime applications for Thermex High Frequency Heating Equipment, The Girdler Corporation, of Louisille, Ky., has recently expanded the manufacturing facilities, research laboratories and engineering staff of its Thermex Division.

Thermex high frequency, electrostatic heating equipment is finding increasing applications in the bonding, drying and heat processing of non-conducting materials. Much of the work to date of this Birdler Corporation division has been concentrated in the wood industries, where the equipment has achieved spectacular results in speeding up production, particularly in the resin bonding of plywood. The Thermex equipment is said not only to step up heat processing operations, but to increase simultaneously the uniformity and efficiency of this work. Its effectiveness is said to apply to all types of non-conducting materials.

Thermex equipment utilizes the principle of generating heat within a mass by exposing it to a high frequency field which sets up molecular friction uniformly throughout the material being treated. As a result of this "inner penetration" action, rapid uniform heating is effected regardless of the thickness of the mass exposed to the high frequency, electrostatic field.

Through its Thermex Division, The Girdler Corporation has pioneered



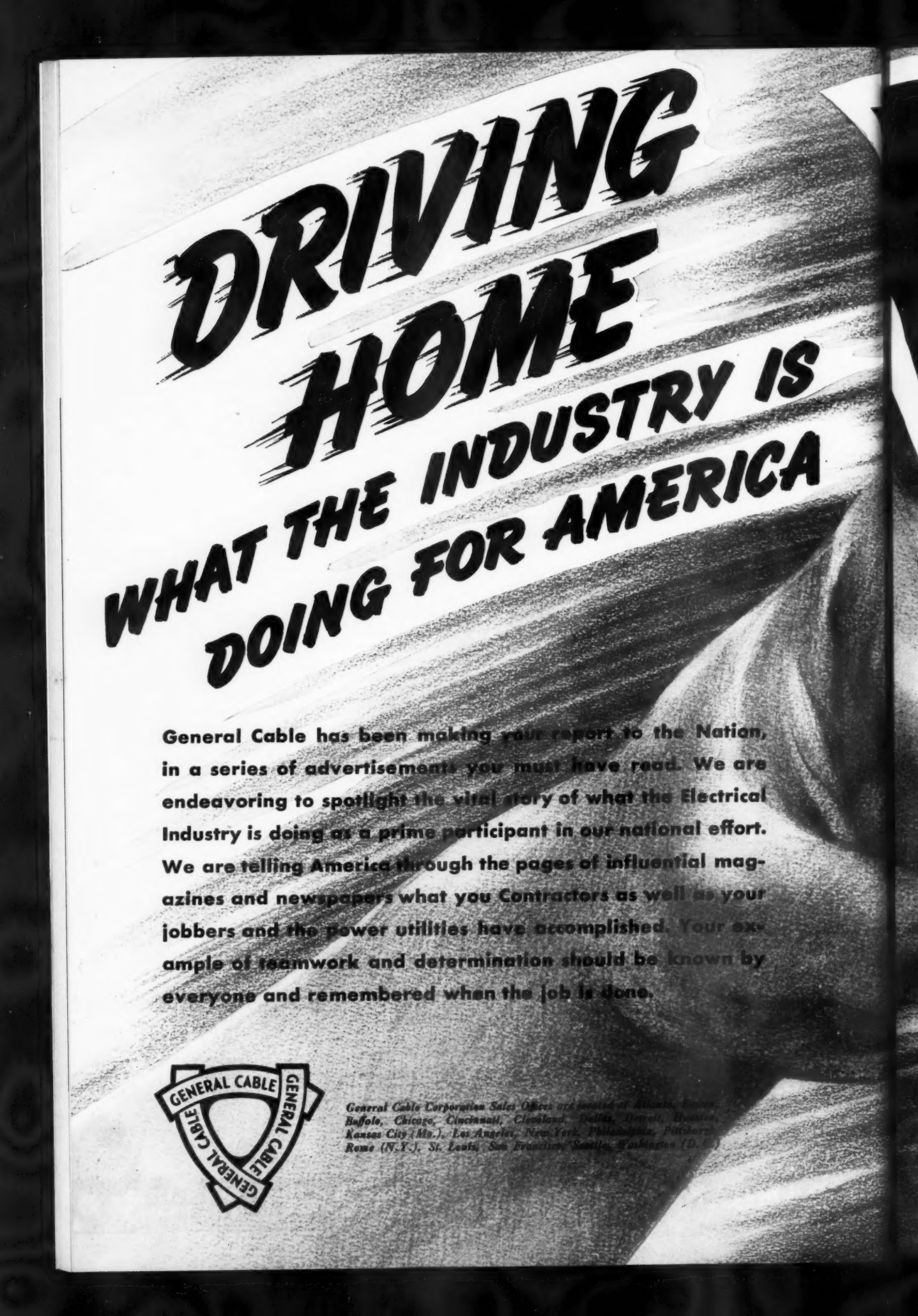
WAR BONDS MAKE UNCLE SAM MORE POWER-*full*

"On Measurement is founded the whole progress of man.."

One foot equals twelve inches, but the inch was not definite enough for King Edward II of England. So, with great pomp and acclaim, in 1324 he decreed that, "three barley corns, placed end to end, shall equal one inch." Since he was King and Lord of everything he surveyed, his word settled everything. Or did it? Despite his power over men, the foot continued to vary from 9¾ to 19 present day inches. That was the conception of standardization. Compare it with today's high standard of measurement of electricity set and met by the electric utilities and the manufacturers of watthour meters.

NO OTHER COMMODITY IS MEASURED SO *Accurately* AS ELECTRIC POWER

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS


DRIVING HOME
WHAT THE INDUSTRY IS DOING FOR AMERICA
General Cable has been making your report to the Nation, in a series of advertisements you must have read. We are endeavoring to spotlight the vital story of what the Electrical Industry is doing as a prime participant in our national effort. We are telling America through the pages of influential magazines and newspapers what you Contractors as well as your jobbers and the power utilities have accomplished. Your example of teamwork and determination should be known by everyone and remembered when the job is done.
GENERAL CABLE
GENERAL CABLE
GENERAL CABLE
General Cable Corporation Sales Offices are located at Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Kansas City (Mo.), Los Angeles, New York, Philadelphia, Pittsburgh, Rome (N.Y.), St. Louis, San Francisco, Seattle, Washington (D.C.)

A SHOCK for Mr. Hitler

THIS is no mere play on words. Ours is a war of production... of armaments, of guns, of ships, of war materials. It is a war of speeded-up manufacturing... of machines and machinery.

And back of machinery is power... electric power that keeps production humming. Truly, the crushing blow that will eventually bring the Axis to its knees will come from the power of electricity as much as from the power of explosives. Yes, the stunning effect of this electrical power may well be called "a shock for Mr. Hitler".

Where is it coming from? Whence this gigantic massing of electric power from the Nation's generating plants? Whence the supply to meet the pyramided demand for wires, cables, switches, terminals... the thousand and one items that go into the making, transmitting and using of electrical power?

It came out of the teamwork that is the American way of doing things. The power companies threw into it their ready-and-waiting plans for plant expansion – for interconnection of systems, for unleashing their pools of power. The electrical manufacturers came through with increased production. The electrical supply warehouses looked after the distribution of equipment to meet the time schedules.

And back of it all, Washington guided, coordinated and applied the pressure where needed. To the War Production Board must go a lion's share of the credit. For the miracle has been wrought. Wherever a machine was installed in America's far-flung war-production line – there the wiring and the power were ready and waiting to start the wheels turning.

The Electric Power in back of American industry packs a wallop – an electrical wallop – a terrific "shock for Mr. Hitler".

☆ Not just one shock for Hitler... but a Series of JOLTS!

Nearly half of the entire productive capacity of all our industries breaking all records in turning out war material. . . .

More than 50% of the world's greatest concentration of Electric Power working to lick the Axis.

An Electric Utility industry with systems interconnected, fuel reserves accumulated, water power husbanded – keeping pace with any war-industry expansion.

Utility Engineers bringing typical resourcefulness into play when power loads mount – ready to find ways to push boiler efficiencies beyond all previous limits, to install new-type cables to deliver the extra power. . . .

Newly built hydro-electric plants adding their to the vast output of the commercial generating stations.

Armies of skilled electrical contractors out on the industrial firing line, installing the wiring for constantly expanding production – guns, shells, tanks, ships, planes! . . .

Men, pledging their skill to keep every electric installation in A.A.A maintenance condition.

GENERAL CABLE CORPORATION

Manufacturing Plants from Coast to Coast

ARMY NAVY

Bare, Weatherproof and Paper Insulated Wires and Cables for Every Electrical Purpose

the development of high frequency heating of non-conducting materials and its application to industrial production.

An interesting booklet which completely describes Thermex High Frequency Heating was recently issued by this company.

Clayton Named President Of Dallas Electric Club

The Dallas Electric Club, of Dallas, Texas, held its annual meeting and election of officers late in December at the Baker Hotel. Features of the gathering were the presentation of an honorary membership to Joe H. Gill, of New York, president of Electric Light & Power Co., a former president of Dallas Power & Light Co., and past president of the Dallas Electric Club. The meeting was also the occasion of the presentation of a handsome wrist watch to W. W. Lynch, retiring president of the Electric Club.

The following new officers were elected to serve during 1943: president, Wm. B. Clayton, commercial vice president and district manager, General Electric Co.; first vice-president, R. W. Roessler, manager, Westinghouse Electric and Mfg. Co.; second vice president, S. A. Stewart, civilian defense coordinator, Southwestern Bell Telephone Co.; secretary, Walter A. Blair, Texas Power & Light Co. (re-elected); treasurer, M. F. Larmer, General Electric Co. (re-elected).

Directors are W. W. Lynch, Texas Power & Light Co.; A. L. Jones, Jr., General Electric Co.; Alfred B. Emrick, Wagner Electric Corporation; R. G. Berle, Westinghouse Electric Supply Co.; and George T. Brundrette, Hubbard & Company.

Oklahoma Adopts New Safety Regulations

Oklahoma regulations affecting construction of light and power transmission lines, telephone and telegraph lines, will be brought up to date by an order of the State Corporation Commission which becomes effective January 1, 1943.

For the past 21 years regulations based on the Third edition of the National Electrical Safety Code, governing safety of such construction, have been in force in Oklahoma.

Under a recent order of the Oklahoma commission, which followed a hearing at which no objections were raised, Part Two of the old Oklahoma regulations, in force since October 31, 1921, is repealed and the safety rules of the United States Bureau of Standard incorporated in Hand Book H-32, adopted September 23, 1941, are substituted.

PERSONAL NOTES
About Men You Know

The appointment of **Robert H. Bishop,** formerly eastern sales manager of the Lighting Division of Sylvania Electric Products Inc., to the post of general manager of this division has been announced by **Don G. Mitchell,** vice-president and director of sales for the company.

Robert H. Bishop

Mr. Bishop takes over from **Charles G. Pyle,** who recently resigned to accept an appointment as managing-director of the National Electrical Wholesalers Association.

Mr. Bishop brings to his new post many years of experience in sales and sales management work, having come to Sylvania six years ago from a similar position with a large office equipment concern. Mr. Bishop's headquarters will be at the company office in New York.

Charles G. Pyle

Mr. Pyle has been identified with the lighting industry since 1920, when he was placed in charge of the Pittsburgh warehouse of the then Hygrade Lamp Company. He was district sales manager in Baltimore when the company merged with the Sylvania Tube Company in 1932. and became assistant sales manager for incandescent lamps of the newly formed Hygrade Sylvania Corporation. In 1939 he was made general sales manager of the lighting division, in which post he was active in establishing the company in its present position in the new fluorescent lighting field. He introduced the comany's first fluorescent lighting unit.

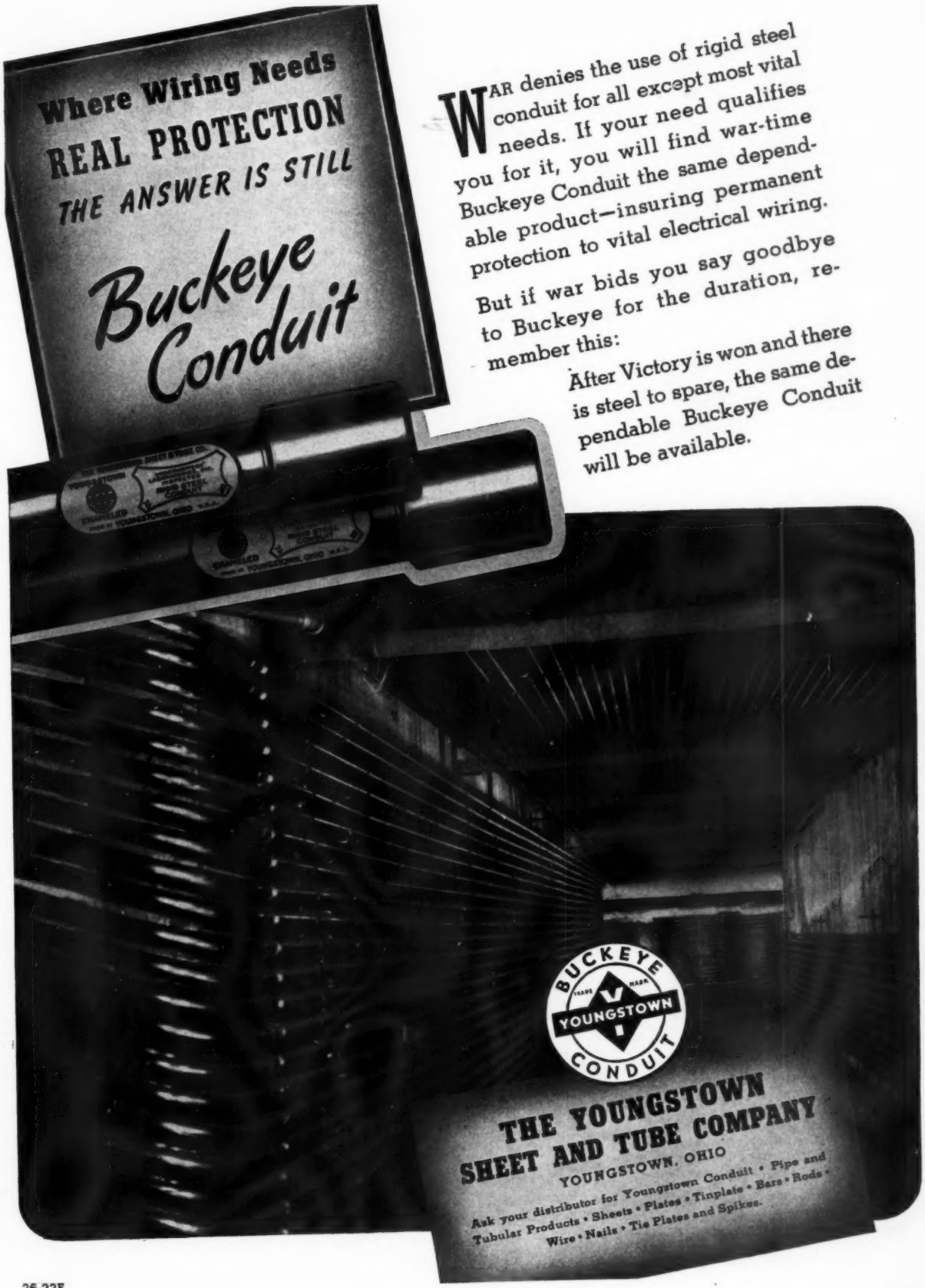
* * *

New responsibilities are assumed by the general staff of Mississippi Power Company to meet war conditions, according to announcement by **L. P. Sweatt,** vice-president and general manager.

F. M. Turner, merchandising manager, will continue to act in this capacity and that of directing activities of the field supervisors on home and commercial lighting of 10 kilowatts and less with the assistance of **William Barrett** of the general office. Mr. Turner will assume, in addition, the duties and responsibilities of the company's purchasing.

G. S. Brandon, formerly purchasing agent, will become the assistant of **R. M. Shearer,** commercial manager, and assist in handling matters in connection with power and commercial lighting, applications, sales, contracts, rates, etc.

Ralph J. Cordiner, former General Electric executive and for the past three years president of Schick Incorporated, has been named to newly created WPB post of director general for war production scheduling. He will work directly under Charles E. Wilson, WPB vice-chairman. Forty-two years old, he is said to be the youngest senior executive in the electrical appliance industry.


Where Wiring Needs
REAL PROTECTION
THE ANSWER IS STILL
Buckeye Conduit
WAR denies the use of rigid steel conduit for all except most vital needs. If your need qualifies you for it, you will find war-time Buckeye Conduit the same dependable product—insuring permanent protection to vital electrical wiring.
But if war bids you say goodbye to Buckeye for the duration, remember this:
After Victory is won and there is steel to spare, the same dependable Buckeye Conduit will be available.
BUCKEYE
YOUNGSTOWN
CONDUIT
THE YOUNGSTOWN SHEET AND TUBE COMPANY
YOUNGSTOWN, OHIO
Ask your distributor for Youngstown Conduit • Pipe and Tubular Products • Sheets • Plates • Tinplate • Bars • Rods • Wire • Nails • Tie Plates and Spikes.

26-22E

Ellis Travers has been appointed director of advertising and public relations for the manufacturing division of The Crosley Corporation of Cincinnati, it has been announced by **R. C. Cosgrove**, vice president.

For the past nine years, Mr. Travers has been vice president of Ruthrauff & Ryan in New York and in Detroit, where he was in charge of that agency's office.

Ellis Travers

Prior to his advertising agency experience, Mr. Travers was director of advertising and assistant sales manager of Nash Motors at Kenosha, Wisconsin. He was with Nash for fifteen years.

* * *

Transfer of **Dean M. Warren,** in charge of technical publicity at General Electric's Nela Park, Cleveland, to Empire Division of the firm's lamp department at Buffalo has been announced at Nela Park headquarters. Mr. Warren will devote full time to wartime lighting of industries in the Buffalo area.

Dean M. Warren

Widely recognized as a leading authority on commercial and industrial lighting, Mr. Warren has for many years been in constant demand not only as a consultant, but also as a speaker on programs sponsored by business and factory groups.

A native of Butler, Pa., Warren received his early education in Butler County and Pittsburgh schools. In 1924 he graduated from Washington & Jefferson College with a Bachelor of Science degree. He joined the lamp works of General Electric in 1926 at Youngstown, Ohio. In the firm's factory there he devoted his time to production and quality engineering work. He transferred to G. E. lamp department headquarters at Nela Park in 1928 where he specialized in illuminating engineering.

In the past ten years at Nela Park Engineering Department, Mr. Warren has superised preparation of hundreds of special articles which have appeared in the trade press, many of these stories appearing under his own name. He is the author of three books on lighting practice, has contributed yearly to Encyclopedia Brittanica and Encyclopedia Americana. He is chairman of the committee which publishes the I.E.S. "Illuminating Engineering" magazine. He is otherwise active in the affairs of the Illuminating Engineering Society.

* * *

D. R. Guthrie has been appointed personnel manager of the Ward Leonard Electric Co., Mount Vernon, New York, manufacturers of electrical control devices, it has been announced by **D. J. Burns**, vice president.

NEW EQUIPMENT and MATERIALS

Square D Controls

Builders of aircraft, tanks, boats, trucks, and practically all types of portable or mobile equipment will be interested in the new Square D "Air-Line"—a complete catalog carrying detailed descriptive and engineering information of compact devices including circuit breakers, relays, switches, contactors, push buttons, limit switches and special purpose devices.

Designed primarily for aircraft and tank use, these devices meet the exacting specifications demanded for these and a wide range of other applications. Each lightweight, compact device will operate efficiently in any position, under these conditions: acceleration of 10 G's; vibration up to 55 cps. at 1/16" excursion; altitudes up to 40,000 feet; temperatures from —60° to +170° F.; (Circuit breakers, —60° F. to +135° F.).

A copy of the "Air-Line" catalog can be obtained by writing the Square D Company, Milwaukee, Wis.

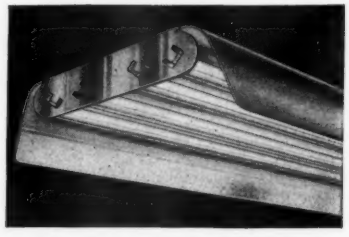
Service Display Card

Premier Division, Electric Vacuum Cleaner Co., Inc., Cleveland, Ohio, has available for appliance dealers an attractive display card promoting Certified-Guaranteed Vacuum Cleaner Service for any make. It ties in with their 28-point plan of testing and repairing that provides a full year new cleaner guarantee for complete money-making repair jobs. Premier reports an ever-increasing number of dealers successfully turning to service with the aid of their simple plan.

Wood-Reflector Fixture

A new powerful lighting unit has been designed by the Edwin F. Guth Co., of St. Louis, Mo., to furnish high-intensity lighting for industrial inspection areas, also to produce illumination for high-bay areas. Conforming with WPB's order L-78, October 19, 1942, this new development features the use of a non-metallic reflector.

Where the visual-task is critical, this Super-Maze-Lite's high intensity illumination enables the inspector to see minute particles under the diffusing quality of fluorescent lighting. When used for high-bay lighting, the four 100-watt size Super-Maze-Lite delivers more lumens than does a 400-watt H-1 mercury lamp, or a 750-watt incandescent lamp lighting unit.



Construction features of Super-Maze-Lite are unique. "Bump-Proof" ends protect lampholders against abuse and insure correct distance between lamps. Reflector has deep light-cutoff and is formed of genuine

The eyes of all America are upon the United States Treasury Roll of Honor appearing in the "Payroll Savings News." For copy write War Savings Staff, Treasury Department, Washington, D. C.

HOW TO "TOP THAT 10% BY NEW YEAR'S"

Out of the 13 labor-management conferences sponsored by the National Committee for Payroll Savings and conducted by the Treasury Department throughout the Nation has come this formula for reaching the 10% of gross payroll War Bond objective:

1. ***Decide to get 10%.***
   It has been the Treasury experience wherever management and labor have gotten together and decided the job could be done, the job was done.
2. ***Get a committee of labor and management to work out details for solicitation.***
   a. They, in turn, will appoint captain-leaders or chairmen who will be responsible for actual solicitation of no more than 10 workers.
   b. A card should be prepared for each and every worker with his name on it.
   c. An estimate should be made of the possible amount each worker can set aside so that an "over-all" of 10% is achieved. Some may not be able to set aside 10%, others can save more.
3. ***Set aside a date to start the drive.***
4. ***There should be little or no time between the announcement of the drive and the drive itself.***
   The drive should last not over 1 week.
5. The opening of the drive may be through a talk, a rally, or just a plain announcement in each department.
6. Schedule competition between departments; show progress charts daily.
7. Set as a goal the Treasury flag with a "T."

As of today, more than 20,000 firms of all sizes have reached the "Honor Roll" goal of at least 10% of the gross payroll in War Bonds. This is a glorious testimony to the voluntary American way of facing emergencies.

But there is still more to be done. By January 1st, 1943, the Treasury hopes to raise participation from the present total of around 20,000,000 employees investing an average of 8% of earnings to over 30,000,000 investing an average of at least 10% of earnings in War Bonds.

You are urged to set your own sights accordingly and to do all in your power to start the new year on the Roll of Honor, to give War Bonds for bonuses, and to purchase up to the limit, both personally and as a company, of Series F and G Bonds. (Remember that the new limitation of purchases of F and G Bonds in any one calendar year has been increased from $50,000 to $100,000.)

TIME IS SHORT. Our country is counting on you to—

"TOP THAT 10% BY NEW YEAR'S"

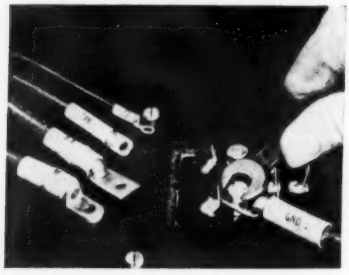
Save with
War Savings Bonds

This space is a Contribution to America's All-Out War Effort by ELECTRICAL SOUTH

Masonite "Reflector-Board." Super-Maze-Lite is available with the new "Forlamp" ballast for 265 volts; also is available for 110-125 and 220-250 volt circuits; in two sizes, either for four 40-watt or four 100-watt fluorescent lamps.

Insulator and Wire Marker

Short lengths of extruded plastic tubing are clearly marked with letters and numerals to perform two jobs. They serve as insulators of terminal connections and as wire markers. Where lug insulation and wire identification are required, they speed assembly by eliminating any additional means of identification.



The tubing from which these new combination insulator-markers are made has very high dielectric strength. Smooth inside surfaces permit quick application over wires and lugs. Legible numerals of the customer's choice are printed on the tubing with an ink that has resistance to chemicals, water and oils equal to that of the tubing itself. Available in colored tubing with either black or yellow symbols, in A.S.T.M. sizes from No. 9 up to 3/8" I.D. For larger sizes, consult manufacturer.

Other tubing made from much less critical plastic materials can be printed and utilized solely as wire markers. Manufactured by the Irvington Varnish & Insulator Company, 6 Argyle Terrace, Irvington, N. J.

Booklet on A-C Welding

Speed is increased 20 to 30 per cent and power costs are cut one-third with the Flexarc A-C Welders described in a new booklet by Westinghouse Electric and Manufacturing Company.

The new 12-page booklet compares advantages of a-c and d-c welding. A-c welders increase output because of the absence of magnetic arc blow, ease in using heavy electrodes with higher currents, and ability to make good welds in all positions.

A complete line of Flexarc A-C Welders, with current ratings from 100 to 500 amperes, is described and illustrated in the booklet. Featured are the 500 ampere industrial welder for high-speed, continuous welding on all types of heavy construction; and the 300-ampere portable welder for heavy-duty work. Both models have built-in power-factor correction.

A copy of B-3136 may be secured from Department 7-N-20, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

Ideal Electric Brazer

The new Ideal electric brazer for brazing and soldering with silver solder, manufactured by the Ideal Commutator Dresser Co., Sycamore, Ill., will find many applications wherever electrical connections must be made. With this new electric brazer, it is easy to braze brass, copper, bronze, steel and dissimilar metals.

A special feature emphasied by the manufacturer is the fact that the brazer requires no preheating, no open flame and no heavy tank or bulky hose. The Ideal electric brazer operates on the same principle as the popular Ideal "Thermo-Grip" soft soldering pliers. The object to be heated is held in the plier jaws and quickly brought up to silver soldering temperature. This leaves one hand free for applying flux and solder, completely eliminating makeshift methods and special jigs for holding the work.

Lap joints, butt joints, scarf joints, and cable joints can all be made with the new brazer. Its uses include electrical connections in motors and transformers, soldering lugs, terminals, and bus bars, repairing band saws, etc.

For further information, write the manufacturer for descriptive folder.

Unit Distribution Panelboard

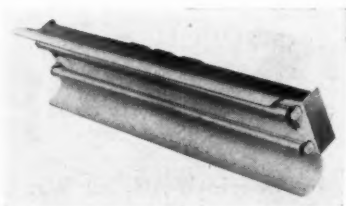
The Trumbull Electric Mfg. Company, of Plainville, Conn., has made available a compact unit distribution panel-board in drip-proof cabinet, having shock-proof fuse clamps for marine applications, such as for lighting, power, intercommunicating systems and radio.

It is available in 6 to 20 circuits. The panel is made of bakelite sections mounted on channel iron rails —service 2/2 wire 125 or 250 volts. Box and cover are of Code gauge steel having priming coat of zinc chromate and finish coat of gray lacquer. Trumbull solderless connectors are furnished in the mains.

These are described and listed on Data Sheets MAR-1 and MAR-1L. Available upon request to Trumbull Electric Mfg. Co., Marine Equipment, Plainville, Conn.

Instantaneous Fluorescents

A new development in fluorescent lighting provides illumination to full intensity without flicker or delay the instant the switch is turned on. In this new unit, named Insta-Lite, ballast and starting switch functions are combined, and no additional starters are required. Since starters are responsible for about 85 per cent of the service required by fluorescent lights, Insta-Lite is said to greatly reduce lighting maintenance cost.



Lighting is instantaneous and starts at lower voltages and temperatures, the manufacturer claims. Additional advantages are lower power loss (power factor 90 per cent or over), minimized stroboscopic effect, and lighting performance stabilized at level of maximum lumen output.

Made for two 40-watt tubes, for 110-125 volt, a-c, Insta-Lite is offered in fixtures for industrial and commercial installation, meeting Bureau of Standard specifications for fluorescent reflectors. Insta-Lite is available in fixtures with non-metallic reflector, conforming to the WPB Limitation Order L-78.

For further details, write the manufacturer, The Spero Electric Corporation, Cleveland, Ohio.

Forced-Convection Heaters

Forced-convection heaters are materially contributing this winter to the health, comfort and efficiency of engineers in the cabs of electric locomotives, guards in towers, and watchmen's houses around industrial plants. The heaters are also being increasingly used in shipyards, hangars, substations, warehouses, crane cabs, and similar out-of-the-way places, the General Electric Company reports.

Controlled automatically, and rated from 2 to 15 kw, General Electric heaters are available in the suspension type for wall and ceiling mounting. The portable type, which while

intended primarily for floor mounting, is readily adaptable for either wall or ceiling use. The heaters are sturdy, economical in operation, and easily and quickly installed, since it is only necessary to connect them to the nearest outlet.

In the case of industrial plants, they effect further economies by eliminating the installation and maintenance of costly steam piping to remote points about the plant, as well as the heat losses from such pipe lines.

Industrial Safety Switches

A 24 page descriptive bulletin covering the design and listings of all types of Square D Safety Switches for industrial applications, includes data on Type A Heavy Duty Industrial Switches, Type C Industrial Switches, General Purposes Switches, (Type D) Double Throw Switches and Manual Motor Starters in standard sheet metal and water tight, dustproof and explosion resisting cast enclosures. Write Square D Company, Detroit, Michigan, for a copy of Bulletin 500.

A CENTURY OF SERVICE

When, at midnight on December 31st the clock chimes twelve, and we pass into the year 1943, so Hubbard and Company will enter its second century in business. We think it is excusable to believe that such survival and notable growth could only be possible for an institution built on solid foundations with a steadfast policy of honest service in all its ten decades of existence.

That past generations of "Hubbard" men have done a splendid job is attested by the Present. We owe all to their courage, devotion and inspiration. We of the Present cannot rest on their laurels. We must turn our eyes to the Future.

On this, the advent of our "century in business," we thank you, our friends, for your ever loyal support and pledge that we of the Present "Hubbard" generation will keep faith with our predecessors of the past 100 years.

May our wishes for your Peace and Happiness bear fruit in 1943. Sincerely and Gratefully,

HUBBARD & COMPANY

Curtis Lighting Booklet

"Curtis Lighting for Vital Industry," is the name of a new 12-page industrial war booklet, Serial 2130, announced by Curtis Lighting, Inc., Chicago, Ill.

The products included in the war booklet are the types which will find most frequent use in industrial plants producing war goods. Particular emphasis is laid on the new "Fluoratex" Non-Metallic Reflector Units and the Silver Mirrored Glass Reflector units for high bay installation, which conserve critical materials. Data are also included on: the Fluorescent Industrial Lighting Units (installed individually or in continuous runs); the 3-kw Industrial Unit for Mazda AH-9 lamps; and the Fluorescent Curti-Strip. Fluracite, the baked white synthetic reflecting surface used on Curtis fluorescent lighting equipment, is also discussed.

On the back page of Serial 2130 are shown units for the industrial offices and drafting rooms—SkyLux, StarLux, SilverLine (exposed trofferer unit), PlastiLux (unit using a plastic diffuser) and "Eye-Comfort" luminairies. Copies are available upon request.

Master Unit Substations

The advantages of master unit substations, manufactured by General Electric Company, Schenectady, N. Y., are presented most convincingly in a new publication just released, Bulletin GEA-3800. The bulletin, attractively printed in color, points out the savings in materials, time, and money resulting from the application of standard co-ordinated-design unit substations.

In addition to numerous photographs of typical installations, the booklet includes a discussion of the various types of industrial distribution including radial, high voltage selective arrangement, low voltage selective arrangement, spot network, and primary network. Another special feature of their bulletin is a set of typical specifications for three different types of master unit substation installations.

Brush Insulation Remover

A rotary wire brush whose surface is as soft to the touch as the nap of a velvet rug, has been developed by The Osborn Manufacturing Company, of Cleveland, world's largest manufacturer of industrial brushes, to help in the construction of radios and sensitive electrical instruments used by Uncle Sam's fighting forces.

The brush, in the form of a cylinder, 1½ inches in diameter and two inches long, is made of mild steel wire .0025 of an inch thick. It is the product of the Osborn Company's extensive analysis of the brushing needs in the electrical industry.

The wire in the brush is so fine and so closely packed that there are nearly a quarter of a million, or more precisely, 242,144 points over the surface area. The brush surface is as soft as velvet, although each point is as sharp as a needle.

Two of these cylinders, mounted parallel and rotating on spindles at 3,450 revolutions or more per minute, were developed to trim very hard-baked insulation off exceptionally fine copper wire used in electrical instruments.

The brush was designed to remove the insulating material without marring the copper underneath. The insulation is taken off as rapidly as the operator can insert the wire between the rotating cylinders and pull it out.

Development of the brush followed many unsuccessful experiments by radio manufacturers in removing insulation, including the immersion of the wire ends into a chemical to attack the insulation and not the metal.

The Osborn technical staff has solved the problems of taking off insulation from wires of a wide variety and size and has made it a highly simplified operation. The brushes are mounted on spindles arranged so that they run parallel in order to clean entirely around the wire. The proximity of the brush surfaces is determined by the job to be done. Each brush may be mounted on a motor, or one motor may be used for both.

Fluorescent Equipment

Seven new industrial lighting units for utilization with fluorescent lamps are pictured, described and listed in new "L-78 Catalog Sheets," now available from the Edwin F. Guth Company, St. Louis, Mo. Masonite, reflectors, non-metallic shielding eggcrates, "Forlamp" units, mechanic's portable, and quick-starting fluorescent units are included. Prices and sizes are listed. Copies are available upon request.

NEW ELECTRICAL BOOKS

(*Continued from page 31*)

engineering and physics. Sufficient theoretical background is given to the various topics to make the presentations convincing, and to give the student an appreciation of at least some of the possibilities which each topic offers. Although a reasonable mathematical background is presented in the discussion, most of the text can be read by a person seeking specific information without becoming involved in the more detailed developments of the theory.

Special features of the book include a laboratory manual covering the experiments which form an integral part of the course, and a very complete bibliography of periodicals and publications relating to ultra high frequency technique.

In addition to chapters on fundamentals, there are included chapters on radio receivers, transmitters, ultra high frequency generators, transmission lines, and hollow wave guides.

Principles of Electronics

By Royce G. Kloefsler. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City, N. Y. 175 pages, illustrated. Price, $2.50.

The growing importance of the science of electronics lends interest to this publication prepared as a short introductory course in electronics for electrical engineering students of sophomore or junior grade. However, practicing electrical engineers, who finished college ten or more years ago, will find this text particularly helpful in obtaining an understanding of the new field of electronics.

The first chapters in the book provide an introduction to the electron, the atom, electricity, and gaseous conduction. Introductory chapters are followed by chapters on electron emission and chapters dealing specifically with the two-electrode tube, the three-electrode tube, the multi-electrode tube, and special tubes. Chapters dealing with rectifying devices and photo electric devices are also included, as well as a chapter on electronic applications and circuits.

This publication is profusely illustrated and assumes only an elementary knowledge of physics and electrical circuits. No advanced mathematics is required of the reader.

MYE Technical Manual

Published by P. R. Mallory and Co., Inc., Indianapolis, Ind. 407 pages, illustrated. Price, $2.00.

Thousands of radio service men, already acquainted with previous editions of the Mallory Radio Service Encyclopedia, issued at intervals since 1937, will want to add this 1942 publication of the Mallory Company to their service library.

The scope of the new MYE Technical Manual is indicated to some extent by the titles of the sections: section 1, loud speaker design and application; section 2, superheterodyne frst detectors and oscillators; section 3, half-wave and doubler power supply svstems; section 4, vibrators and vibrator power supplies; section 5, phono-radio service data; section 6, automatic tuning; section 7, frequency modulation; section 8, fundamentals of television engineering; section 9, d-c dry electrolytic capacitors; section 10, practical radio noise suppression; section

ENCORE

Hotpoint's War Bond Advertising Program Will Play a Return Engagement in 1943

FROM all quarters—government officials, war savings administrators, utility companies, department stores and retailers—comes praise of Hotpoint's forward-looking plans for wartime advertising.

The slogan "Buy War Bonds Today — Electric Kitchens Tomorrow," was introduced by Hotpoint as a wartime national advertising theme. It not only stimulates the sale of War Bonds, but creates confidence in the future that will build a backlog of consumer demand by encouraging a patriotic accumulation plan to assure funds with which people can buy the products of peace. Thus the program helps the war effort today and provides for postwar prosperity and peacetime employment.

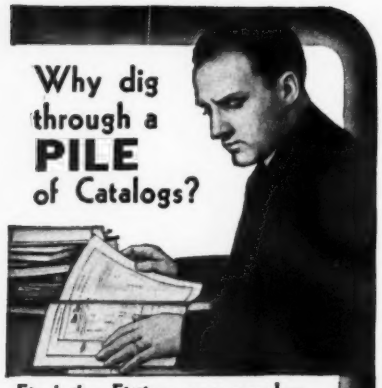
Widespread support of the theme through local advertising and use of Hotpoint's novel Home Planning File in hundreds of cities has been gratifying. The program has been so successful that it will be continued in 1943 with increased advertising in the leading national magazines.

Plan now to tie up with this great program in 1943 by providing for it in your activities. Further details will be released during January. Edison General Electric Appliance Company, Inc., 5614 West Taylor Steet, Chicago, Illinois.

Hotpoint

ELECTRIC KITCHENS

Refrigerators • Ranges • Water Heaters • Washers and Ironers • Clothes Dryers • Automatic Dishwashers • Electrasink • Steel Cabinets



Find the Fitting you need—quickly—in the COMPLETE line

If you have a Penn-Union Catalog, you can instantly find practically every good type of conductor fitting. These few can only suggest the variety:

Universal Clamps to take a large range of conductor sizes; with 1, 2, 3, 4 or more bolts.

L-M Elbows, with compression units giving a dependable grip on both conductors. Also Straight Connectors and Tees with same contact units.

Bus Bar Clamps for installation without drilling bus. Single and multiple. Also bus supports — various types.

Clamp Type Straight Connectors and Reducers, Elbows, Tees, Terminals, Stud Connectors, etc.

Jack-Knife connectors for simple and easy disconnection of motor leads, etc. Spring action — self locking.

Vi-Tite Terminals for quick installation and easy taping. Also sleeve type terminals, screw type, shrink fit, etc. etc.

Splicing Sleeves, Figure 8 and Oval, seamless tubing—also split tinned sleeves. High conductivity copper; close dimensions.

L. MORRIS LANDERS
309 WALTON BUILDING
ATLANTA, GA.

WALTER J. HUEMMER
DALLAS TRANSFER & TERMINAL WAREHOUSE BLDG.
DALLAS, TEXAS

PENN-UNION ELECTRIC CORPORATION,
ERIE, PA.

PENN-UNION
Conductor Fittings

11, vacuum tube voltmeters; section 12, useful servicing information; section 13, receiving tube characteristics.

The outstanding feature of this technical manual is its practicality. It contains only as much theoretical information as is absolutely necessary, the remainder being a practical type of data needed by the service man. The hundreds of charts and circuit diagrams greatly simplify the text itself.

Motors and Motor Controls

A series of practical booklets in mimeographed form published by the Educational Advancement Company, Lakewood, N. Y. Price, $2.50 each.

Several booklets in this series published by the Educational Advancement Company will be of special interest to electrical motor rewinders and electricians. One publication, entitled "The Three-Phase Motor and Generator," includes a description of the fundamentals that enter into the design of an alternating current motor and generator which is followed by actual rewinding data on several hundred two-phase and three-phase motors of one horsepower and above.

Another publication, entitled "A-C Motor Diagrams, Tables, and Controllers," includes a comprehensive description of single phase motor circuits as well as three-phase. This booklet includes numerous diagrams showing methods of grouping coils, etc.

"Motor Controls and Protective Devices," is the title of another in the Educational Advancement Series. Designed as a practical reference book on motor controls and thir applications, it includes information on the construction and application of relays, meters, switches, elevators, switchboards, drum controls, starting boxes, etc. Although the text pages are mimeographed, they are easy to read and include hundreds of diagrams which help explain the text.

Reading As a Visual Task

By Dr. Matthew Luckiesh and Frank K. Moss. Published by D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York City. 400 pages, illustrated. Price, $5.00.

Dr. Luckiesh, director of Lighting Research Laboratory at General Electric's Nela Park, Cleveland, and his colleague have made another outstanding contribution to the Science of Seeing. The book brings into clear focus a host of hitherto unknown facts concerning the universal task of reading. It reveals many of the causes and effects of defective eyesight, gives the reader invaluable insight as to the prevention and cure of evils besetting modern man, especially in the field of reading.

Although "Reading As a Visual Task" is a scientific approach to the problem, the book was written not without the lay reader in mind. Consequently, the work contains a wealth of practical information which should help the average man to greatly minimize eye strain, conserve nervous energy, and improve his welfare generally.

Photoelectric Motor Tester Improved

(*Continued from page 27*)

vided so that a chronograph, or any other device which operates on current impulses, can be actuated by the impulses of the current obtained when the light beam falls on the phototube. The synchronous-clock method of testing watthour meters can also be used. In this case the load on the meter is carefully held at a predetermined value, and the synchronous electric clock operating on constant frequency is started and stopped in the same way as a rotating standard.

New features of the tester include two separate revolution selectors on the control box, one for light loads and one for full loads; a built-in light-dark switch which makes it possible to test meters by shining light through the anti-creep holes of the meter disk or by reflecting light from the edge of the disk; a combination reset-and-start lever-type switch more convenient than the two push buttons previously supplied; and connections in the back of the cabinet where circuits are clearly marked for convenience. The grid-bias adjustment of the former type G-E tester has been eliminated, with the result that no adjustments are necessary.

The new control box is smaller and lighter than the former model, and is enclosed in an attractive, gray, wrinkle-finish, sheet-metal case. Complete equipment consists of a stand, with a light source at the top and a phototube below, and the control box.

Small Appliance Service Guide

(*Continued from page 24*)

To clean: use scouring powder lightly, brush with stiff bristle brush (not wire), and oil grids with vegetable oil before using.

Top Side of Waffles Not Done—cover left open too long before batter was poured permitting upper grid to cool.

Grids Hard to Clean—waffle

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO WIRES • SIGNAL CABLE • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE

CRESCENT
ANSWERED THE CALL

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

Long before Pearl Harbor we were in total production for Defense. Now we are in

Total Production for War!

CRESCENT INSULATED WIRE & CABLE CO.

CRESCENT
WIRE and CABLE
Factory: TRENTON, N. J.—*Stocks in Principal Cities*

SOUTHERN REPRESENTATIVES

ATLANTA, GA.	NEW ORLEANS, LA.	DALLAS, TEXAS
Edgar E. Dawes	Paul Hogan, Jr.	Huie-Simmer Co.
A-4 Rhodes Bldg. Annex	823 Perdido St.	103 Thomas Bldg.

CRESCENT ENDURITE SUPER-AGING INSULATION • WEATHER-PROOF WIRE

First Aid MECHANICAL
FOR INDUSTRIALS

"SCRUWEDGE"
STOCK SET

The "Scruwedge" Stock Set is the ideal way of carrying a complete inventory of small size connectors directly to the job so the electrician is ready for any emergency.

"GORILLA GRIP"
STOCK SET

"Gorilla Grip" Stock Sets provide a method of stocking heavier types of lugs and mechanical connectors for emergency uses. The standard set makes 125 combinations, or a set may be built to meet your plant requirements.

Write today for "Gorilla Grip" booklet.

National Electric
PRODUCTS CORPORATION
300 FULTON BUILDING, PITTSBURGH, PA.

iron grids were designed to be cleaned with stiff bristle brush only. Do not use salted fats or oils.

Branch Circuit Fuse Blown—wall plug may be loose or cord broken.

WASHING MACHINES

Does Not Operate—check for current up to machine. Be sure all connections are tight and prongs on plug are properly contacting wall outlet. Inspect motor drive. If washer is stored in cold room, oil may be too stiff to allow motor to start washer. During winter months bring washer into warm room and allow to warm up to room temperature before beginning washing.

Clothes Not Clean—not washing for long enough periods, overloading machine, improper filling of tub with water. Not enough soap to create proper suds; water too hard.

Clothes Tearing — excessive washing time, improper loading of washer, clothes packed too tightly in washer, agitator out of adjustment, agitator has sharp projecting edges, too many clothes and not enough water.

Rolls Not Operating Properly—the upper roll is operated by friction, if the surface becomes slick the roll will not turn. Remove roll from upper bracket, get fine grade sandpaper, start machine, run sandpaper back and forth on roll in lower bracket, replace upper roll and use same process. Clean with warm soap and water and use household ammonia to complete job. Excessive or insufficient pressure may cause rolls to be inoperative, gears may be stripped or worn.

To Preserve Washer—after each washing, wash tub thoroughly, rinse, remove agitator and leave lying in bottom of tub. Relieve pressure on rolls, wash with warm water, roll turkish towel or good grade paper between rolls, leave until next washing.

VACUUM CLEANERS

Fails to Clean Properly—clean bag by turning inside out. Check filters. Check belt and if stretched or broken, replace or repair. Check rotary brushes for improper adjustment or wear. Remove hair, strings and other objects from brush roll; oil. Poor or incorrect hose connections.

Cleaner Will Not Run—check for blown fuse. Defective cord, switch or plug. If carbon brushes check for wear, or bent armature shaft.

Tax Problem Study Justified

(Continued from page 21)

to come. If you lose money one year and earn a profit the next, you can tap the two previous years or the two succeeding years and take a deduction therefrom.

Under the 1942 regulations you can deduct all expenses resulting from income-producing activities, whether connected with your regular business or outside activities. This was not permitted before. You had to pay tax on income received from all sources but expenses were deductible only on your regular business activities, which was manifestly unfair. Now, you may deduct expenses if they were obligations in connection with an enterprise that earned you an income. This does not include non-income producing activities. If you spend money on a hobby, you cannot deduct such expenses because you do not earn money therefrom.

In one case coming to our attention, the taxpayer paid 15 per cent of net earnings in 1937, 19 per cent in 1938 and 1939, 25 per cent in 1940 and 45 per cent in 1941. Under the 1942 levies and the increased taxation certain to come in 1943, this taxpayer's income will be hit with a 70 per cent income tax levy, making it impossible for him to meet certain long-term debts he had contracted when the huge wartime increase in taxes was not foreseen and when it was assumed that taxes would not take more than 20 per cent of earnings, leaving sufficient margin for debt reduction and liquid working capital.

Whether he can get an extension on debt payment is problematical but this case history is indicative of the big problem facing all business men, not only this year, but for many years to come and it serves to show that tax expense today cannot be taken as lightly as in days when rates were safer for survival.

The counsel given in this article is based upon fundamentals in the tax law and will be useful in effecting economy, not only this year, but during the war economy and throughout the postwar years.

The Power Industry At the Year's End

(Continued from page 8)

lion kilowatts, or 3 per cent of the total. Other factors in the overestimates made a year ago were insufficient allowance for decrease in the non-defense industrial load and the failure of war loads to materialize as rapidly and as much as had been anticipated.

Construction Budgets for 1943

In 1942, the electric utility companies of the United States spent, in round numbers, $482,000,000 on new construction. This compares with a total of $592,000,000 in 1941 and $622,000,000 as the budget for 1942 proposed last year. Because of limitations on the supply and use of materials the actual expenditures were only 78 per cent of the amount budgeted. The curtailment, however, was largely in distribution and general plant where only 65 per cent of the budget was expended and compares with 86 per cent for generating and transmission facilities.

The principal items are approximately as follows:

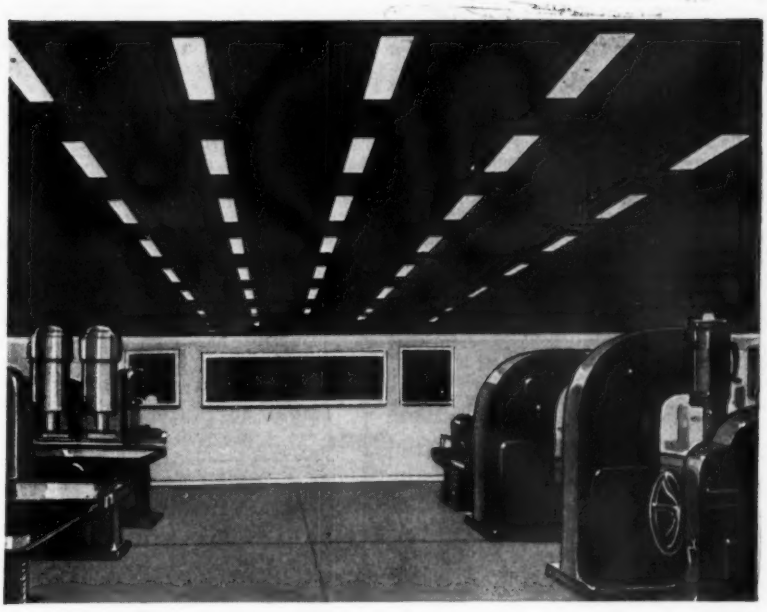
	1942 Expenditures	1943 Budget
Generation	$224,000,000	$129,000,000
Transmission	94,000,000	30,000,000
Distribution	148,000,000	90,000,000
General	16,000,000	7,000,000
Total	$482,000,000	$256,000,000

Ample Capacity in Every Sector

In view of existing margins of reserves in generating capacity and scheduled additions to this capacity in 1943, it now appears that in every sector of the country there will be ample generating capacity to serve the peak demands of 1943.

Output of electricity in 1942 by all agencies contributing to the public supply totaled approximately 188,500,000,000 kilowatthours, an increase of 20,330,000,000 kwhrs, or 12 per cent over the production in 1941. This increase is somewhat less than the 23,185,000,000 kilowatthours, or 16 per cent, registered in 1941 over the previous year.

In 1942, fuels produced 125,300,000,000 kilowatthours, an increase of 7 per cent and water power produced 63,200,000,000, an increase of 23 per cent over output in 1941. This remarkable gain in hydroelectric production reflects the breaking of the drouth which prevailed east of the Mississippi for the greater part of last year as well as the further in-



Lamp Insurance?

Yes, Sir, you can insure longer lamp life with G-E Starters because they give —

CONTROLLED STARTING

Controlled starting means the starter lights the lamp at the precisely right moment — not before, not after. This cuts to a minimum the amount of emission material used. And it is the excessive use of this material that shortens lamp life.

"MASTER NO BLINK" STARTER

Here's the starter that's recognized as 1942's outstanding contribution to better fluorescent lighting.

It is a manual reset starter that completely eliminates blinking and flickering, and saves you power, maintenance time and war vital materials.

This new G-E Starter instantly cuts out a dead lamp from the circuit. No current is used to keep the lamp locked out. No current is wasted trying to restart the dead lamp. No wasteful wear and tear is placed on the starter and ballast — all of which means a saving in current and vital materials.

THE WHOLE STORY'S IN THIS FOLDER

The full line of G-E Accessories and their proper use for best fluorescent lighting may be had by writing to General Electric Co., Section G133-16, Appliance and Merchandise Dept., Bridgeport, Conn.

GENERAL ELECTRIC

FREE IDEAS

on how to

SAVE HOURS OF WORK WITH BETTER TOOLS

ASK FOR THIS LITERATURE SHOWING HOW GREENLEE TOOLS CAN SPEED UP YOUR CONSTRUCTION JOBS

Get the facts about the complete line of Greenlee Benders and attachments for tubing, conduit, pipe, and bus-bar ranging from ¾ to 4½ inches, in the Greenlee Bender Booklet, S-116.

BENDERS

This Greenlee Folder S-114 describes the handy Greenlee Knockout Tools for enlarging knockouts and holes in metal without long tedious drilling, reaming, or filing.

KNOCKOUT TOOLS

The Greenlee Cable Puller Folder S-115 shows how this handy tool, which clamps right on to the conduit through which the cable is pulled, can make the tough job of cable pulling easy for the electrician.

CABLE PULLERS

Here's the Greenlee Folder S-113 which describes a few of the popular fast and smooth-boring bits from the complete line of Greenlee Boring Tools.

BORING TOOLS

For the contractor interested in learning how to lower underground pipe installation costs, this Greenlee Folder S-117 describes the powerful Greenlee Hydraulic Pipe Pushers.

PIPE PUSHERS

MAIL COUPON TODAY

Please send: ☐ S-116 Bender Booklet ☐ S-114 Knockout Tool Folder ☐ S-115 Cable Puller Folder ☐ S-113 Boring Tool Folder ☐ S-117 Pusher Folder.

Name_____

Address_____

City_____ State_____

My Jobber Is_____

GREENLEE TOOL CO.

1761 Columbia Ave., Rockford, Illinois

stallation of 1,000,000 kilowatts of hydroelectric generators during 1942.

Heeding last summer's counsel of the Bituminous Coal Division, utilities have enlarged their coal storage to the highest amount on record. They now are carrying almost four months supply an amount ample to last through the winter. Normally their coal storage is 80 days supply. This storage measure has helped to even out the seasonal demands for coal and to make more flexible the demands on railroad service.

In 1942, fuels produced 125,300,000,000 kilowatthours, an increase of 7 per cent and water power produced 63,200,000,000, an increase of 23 per cent over output in 1941. This remarkable gain in hydroelectric production reflects the breaking of the drouth which prevailed east of the Mississippi for the greater part of last year as well as the further installation of 1,000,000 kilowatts of hydroelectric generators during 1942.

Heeding last summer's counsel of the Bituminous Coal Division, utilities have enlarged their coal storage to the highest amount on record. They now are carrying almost four months supply an amount ample to last through the winter. Normally their coal storage is 80 days supply. This storage measure has helped to even out the seasonal demands for coal and to make more flexible the demands on railroad service.

In addition to the production by public utilities, a considerable number of manufacturing plants and mines produce their own electric power. These plants are estimated to have generated some 46,500,000,000 kilowatthours during the year.

If to the production of public utilities is added this production of their own power by manufacturing plants and mines, the grand total output of electric power from all sources in the United States is 235,000,000,000 kilowatthours. In 1938, Germany produced 55 billion, Italy 15, Japan 27, Russia 33, Great Britain 31, France 20, and Canada 26. All the world combined produced 465,000,000,000 kilowatthours. Estimating from previous rates of growth and various indications of subsequent construction programs, the probable world production of power in 1942 was about 600 billion kilowatthours and the probable world production in Axis dominated areas about 200 billion kilowatthours.

Sales of Electricity

Except for street and highway lighting, which has been drastically curtailed by the requirements of the war, all classes of service showed practically the usual rates of growth during the year.

The use of electricity in the home increased by nearly 2,000,000,000 kilowatthours, or by 7½ per cent. In spite of the practical cessation of sales of household electric appliances early in the year, the annual electrical use of the average residential customer crossed the 1,000 kilowatthour mark last March and now stands at 1024 kilowatthours per year. This represents an increase of 38 kilowatthours, or 4 per cent, over the figures for 1941. At the same time, and in the face of rising costs of living and doing business, the average price of electricity for this service was reduced to 3.67 cents per kilowatthour from a figure of 3.73 cents for 1941.

Compared with September, 1939, when hostilities in Europe began, the individual items of the cost of living, as shown by the U. S. Department of Labor have shown the following changes:

Food	**+35%**
Clothing	**+25%**
Housefurnishings	**+21%**
Rent	**+ 3%**
Fuel and ice	**+18%**
Entire Cost of Living	**+19%**
Electricity	**— 2%**

The price of electricity has continued its steady decrease, the composite average for all domestic use having declined from 4.04 cents per kilowatthour for the twelve months ending with September, 1939 to 3.68 cents for September, 1942.

Except for taxation, the 1942 financial results were, in general, satisfactory. Total revenues of the private companies in 1942 approximated $2,630,000,000 an increase of $155,000,000 or 6½ per cent over the year before. According to the financial reports published for the first ten months of the year (with November and December estimated) operating expenses and depreciation rose at about the same rate as revenues, while State and local taxes showed only a slight change. As a result, net income after all charges, but before Federal taxes, is expected to show a gain of some $55,000,000 or 6½ per cent, over a year ago. Federal taxes, however,

have increased from $300,000,000 last year to an estimated total of $410,000,000 in 1942. This rise of $110,000,000 in taxes wipes out all of this gain in net income and leaves the balance for stockholder's return and surplus some $55,000,000 less than it was last year.

The total of all taxes,—Federal, State and local—is estimated at $635,000,000 for the year 1942. This represents an increase of $114,000,000 or 22 per cent, coming on top of an increase of 29 per cent last year. During the four years 1938 to 1942, taxes on electric utilities have doubled, whereas revenues have increased by only a third. Taxes now consume 24 per cent of every dollar collected from the user of electricity.

The composite income statement of the operating electric utility companies will show a net income, after all charges and taxes, of about $485,000,000 for 1942. This represents a decrease of some 10 per cent from the $539,000,000 earned in 1941.

After the payment of $130,000,000 in preferred dividends about $355,000,000 will be left for the return on common stocks and for surplus. This is $55,000,000 less than in 1941. The continuing decline in net income during the past two years is directly due to the Federal excess-profits tax.

Price Regulations for Machinery Service

(Continued from page 12)

tions or change in conditions of delivery). Do not report if reported previously under this section, unless the new price is higher than last price. Report to contain:

1. Description of the machinery service.
2. (a) Price on the service prior to price increase; (b) Date of such service; (c) Name and description of purchaser of service.
3. (a) Price charged on March 31, 1942, or on the first sale subsequent thereto; (c) Date of such service.
4. New price.
5. Date of entering into the contract providing the increased price.
6. Name and description of purchaser of service.
7. Explanation of higher price.

Date due: Within 10 days after

Why Waste Time and Lose Orders by Shopping Around?

• Today speed counts more than ever. Spero will back you up with *prompt deliveries* on five complete lines of quality electrical products, *priced right.* Speed your estimates, and guarantee quicker deliveries by quoting only from this one reliable source. Here are a few leading items:

SPERO DUR-O-LITE FLUORESCENT FIXTURES

Available with non-metallic reflector and raceway with as little as 6 ounces of steel per foot. The only fixture made of synthetic resin bonded plywood, cutting steel requirement 90%. Meets Bureau of Standard reflector specifications.

with INSTA-LITE

New Spero-development provides instantaneous lighting, eliminating starter and maintenance due to starter troubles.

SURFACE CABINETS

All sizes—hinged on long or short sides. Concentric knockouts as required.

SHALLOW AND DOME TYPE REFLECTORS

Approved Government Types — One-piece, seamless spun construction. Also glass-steel diffusers. Made in lamp sizes of 75 to 750 watts.

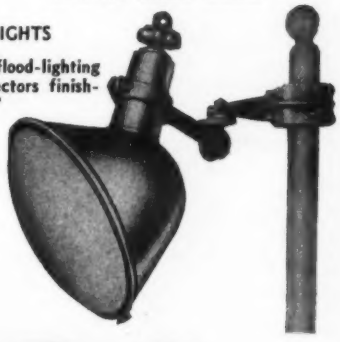
With and without sockets.

WIRE-HOLDERS

One, two or three point wire-holders and brackets with metal cap-assembly (Pat. Pending) reinforcing porcelain against breakage.

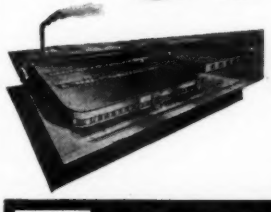
FLOOD LIGHTS

Wide variety of flood-lighting equipment. Reflectors finished in "Duralum."



SWITCH PLATES

Unbreakable plates — brown or ivory. Durable baked-on wrinkle finish.



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18222 LANKEN AVE. ★ CLEVELAND, OHIO

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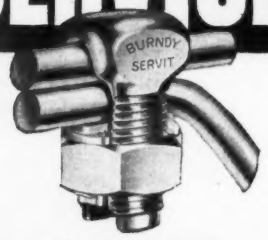
FOR FASTER
SERVICE



Use the Burndy Servit anywhere an end-to-end, parallel or tee connection is wanted. Just tighten a single nut. It's quick, secure and compact.

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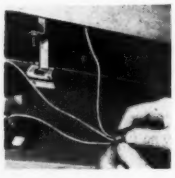
Faster!

IDEAL Wire-Nuts
Solderless, Tapeless, Wire Connectors

"Wire-Nuts" thread onto wires like a nut on a bolt; Strip Wires, Screw On, That's All! SAVE CRITICAL MATERIALS. Lead, Tin and Rubber. FULLY APPROVED; Listed by Underwriters' Laboratories, Inc. Millions in Use. SIZES FOR EVERY JOB. Immediately Available.



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Other War-Time Wiring Job Speeders

IDEAL SOLD THROUGH JOBBERS
IDEAL COMMUTATOR DRESSER COMPANY
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performing the service at such increased price.

Establishment of New List Price Under Section 1390.13(b). New list prices (as determined under Section 1390.7 or 1390.9). Report to contain:

1. Proposed list price.
2. Proposed effective date.
3. Class or classes of purchasers to whom such price is to be quoted.
4. Relevant data used in determining such price.
5. Evidence that such price was determined in accordance with the applicable provisions of MPR No. 136 as Amended.

Report due: (a) When the machinery supplier wishes to establish a new list price, or (b) when required in writing by the OPA.

Machinery Services in New or Converted Plants or Shops Under Section 1390.9(c)(2). Maximum services, new or converted plants or shops (No written or printed price list). Report to contain:

1. Proposed price.
2. Proposed billing date.
3. A statement of whether or not such machinery service had a published or confidential rate or charge in effect on March 31, 1942.
4. All relevant price-determining data, including evidence that the proposed price was determined so far as possible in accordance with Section 1390.9(b) (regarding services without list prices).
5. A brief description of the newly constructed or converted plant or shop.
6. A statement that a report is also being filed in accordance with Section 1390.13 (File under Section 1390.13 only if the supplier desires the proposed price to become the maximum price applicable to such machinery services thereafter performed).

Report due: Manufacturers may file reports at any time prior to, but must file within five days after, either quoting, contracting or performing the machinery service at the proposed price.

Whenever any doubt arises as to your obligations and responsibilities under MPR No. 136 as Amended, consult the regulation itself. If you still need help, write or call any OPA office. Each of these has a staff of men competent to provide answers for the price regulation problems which may confront you.

Protection for Motor Circuits

(*Continued from page 17*)

A are considered as one class and the maximum allowable fuse size or circuit breaker to be used for branch circuit protection cannot exceed 150% of the motor full-load rated current. Motors having code letters B to E, inclusive, may have fuses rated at 200% if the motor is auto-transformer started or 250% if full voltage, resistor or reactor started. If circuit breakers are used this protection must not exceed 200% of the motor full-load current rating. Similarly, all motors with code letters F to R, inclusive, are grouped: for full voltage starting, etc., the fuse may be rated for a maximum of 300% and the circuit breaker 250%; for auto-transformer starting this is reduced to 250% and 200% for fuses and circuit breaker, respectively.

The code letter is not to be applied to any d-c motors, a-c motors rated below ½ hp, or polyphase wound-rotor motors. For these motors and all of the older

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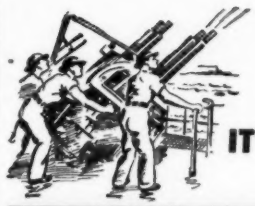
ALL ROOMS NOISE-PROOFED
RATES FROM $3.00

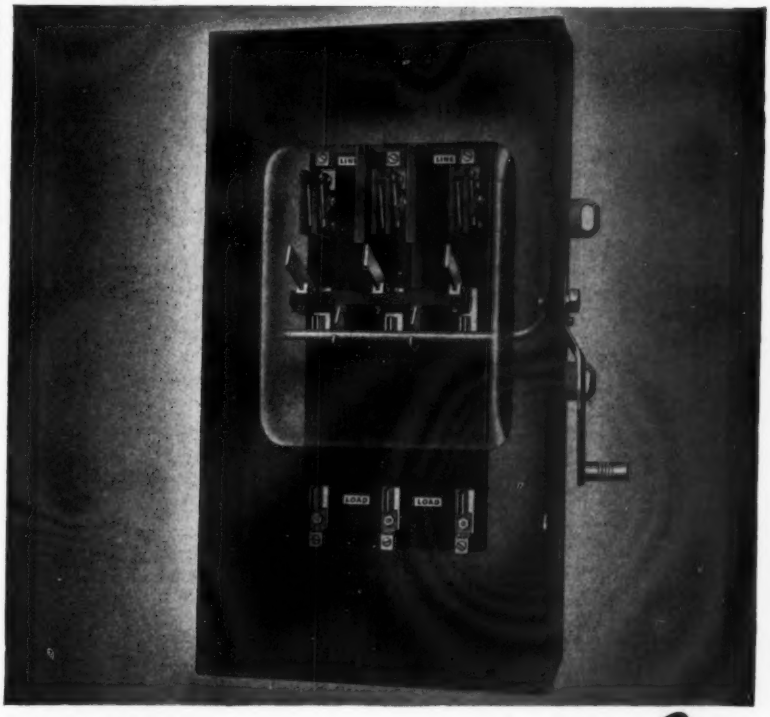
types of motors manufactured before the code letter rule could be applied, Table 27 of the Code is used to determine the maximum branch circuit overcurrent rating. Depending on the type of motor, size, starting conditions, and type of protection unit, i.e., fuse, instantaneous or time limit circuit breaker, the maximum size or rating of the unit may vary from 150% to 300% of the motor full-load rated current.

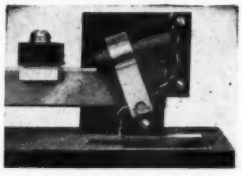
Referring again to the examples given above it will be noted that the 5 hp motor with the code letter **M** would require an approximate locked rotor current ranging from 130 to 145 amperes. The inrush starting current may therefore be 9 to 10 times this value. The question arises, therefore, does a 300% maximum rated starting fuse or a 250% maximum rated circuit breaker (motor branch circuit protective device) permit proper starting and acceleration of the motor to rated speed and load pickup. Seemingly, a 45 ampere fuse or a circuit breaker set for 37½ amperes should blow quite readily if a current of approximately 140 amperes should flow through it. Actually, however, the thermal capacity of these units are such that they can absorb the energy developed during the extremely short period during which this current flows. In fact, the thermal capacity and inherent inertia of the circuit breaker permit it to be set at even a smaller value than the permissible maximum fuse rating.

There are cases where the use of fuses and circuit breakers rated within the limits set forth in Tables 26 and 27 will not offer practical branch circuit protection. In the case of the motor discussed in the above paragraph, it may be found that the fuses will blow upon starting. This may be due to any number of reasons. For example, specially designed equipment may require a slightly longer starting period; or the direct connecting of the loading device, such as a pump or line shafting, will keep the starting current flowing for a longer period of time. In these cases, as previously indicated, the branch circuit protective device may be rated as high as 400% of the motor full load rated current.

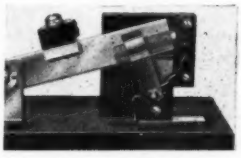


IT'S YOUR PIGEON, TOO, MISTER

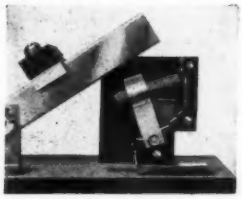




View of Rolarc snuffer showing blade in full engagement with live contacts before passing thru rollers towards OFF position.



View of Rolarc snuffer showing blade at point of final disengagement from live contact jaws.



View of Rolarc snuffer showing blade after disengagement from live contact and rollers. Rollers snapped together again obstructing path of possible arc.

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..DESIGNED TO DO THE JOB

Winning the war is our problem—our job as much as it is the job of the men manning the guns. It's our "Pigeon"—and yours.

To get the job done—to help do it faster and better—Federal developed the 575 Volt Rolarc Safety Switch. Here's a dependable, hard working switch, 100 to and including 600 ampere capacity, built to carry the load.

Engineered on an entirely new principle of arc control, the Rolarc reduces the possibility of arcing to an *absolute minimum.* It lengthens switch life and conserves war-vital copper . . . it increases the safety factor and saves priceless time and power by eliminating dangerous arcing . . . it increases production by eliminating delays caused by switch failure.

If production is "your pigeon" let the Federal Rolarc Safety Switch help get the job done. *Get all the facts—write for bulletin 42-12.*

Until stocks on hand are exhausted we must reserve the right to ship our regular 575 Volt Safety Switch unless Rolarc is specified on the order.

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PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

Equipment Repair Is Essential War Work

(Continued from page 14)

other machine parts, equipment for welding, etc.

Varnish barrels are under the floor, with tight lids, and a crane is used for dipping. There is a large gas-operated baking oven, completely automatic, about 8 x 10 x 10 feet in size, which can be heated to 600 F, if desired, though the normal baking heat is 250 F.

For smaller and quicker baking one of the new infra-red ray outfits has been provided. It consists of two movable stands, each with twenty-four 250-watt lamps with reflectors. The stands are placed opposite each other, forming an oval tunnel of adjustable size for coils to be baked. This unit cuts baking time from 48 hours to four or five, depending on size. In fact, when it is used continually, coils can be baked just about as fast as the mechanics can make them up.

Near the center of the shop is a rectangular enclosure containing the small motor department, which is so complete that its corps of a half-dozen or more men can do their work from start to finish without leaving the enclosure. It has its own baking apparatus, complete motor winding and rebuilding equipment; also a testing stand that enables mechanics to test the motor when it is received and again before it is turned out for delivery to the customer.

There are rest rooms, showers and wash rooms and lockers—everything needed for convenience of employees.

The business is owned by Mrs. Anna A. Fagan and her son, Ellis M. Fagan. It has been serving the electrcial needs of Arkansas for thirty years. Mrs. Fagan and Mr. Fagan each has a private office, adjoining the general office at front of building, and convenient to the shop. Both offices are finished in panelled walnut and are beautifully, yet simply, appointed, with unobtrusive fluorescent lighting.

Next to the general office is customers' entrance, and across from the office is the parts and sales department, where large stocks of new motors and supplies and equipment are maintained.

Some Pointers On Industrial Maintenance

(Continued from page 10)

spaces exposed to large amounts of dust, should be cleaned oftener than every six months, and suction cleaning should be used to prevent dust from being blown into vital parts of the machines.

Should a motor become exposed to dampness for long periods it must be dried out with the best means available. For small motors, oven drying is recommended. Oven drying is impractical for large motors, but heating arrangements may be made which will serve the purpose. A heated enclosure, with heat being supplied from grids or lamps, will remove the moisture. Such an arrangement should be provided with ventilation openings at top and bottom so that air will circulate through the enclosure. Low-voltage current should be applied to a motor for drying internally, and when this is done the rotor must be blocked. The drying temperature should not exceed 210° F.

When motors or other apparatus are being oiled or greased, great care should be taken to add only the required amounts. Excess oil and grease will get into the motor parts and act as catchers for particles of dirt. Oil on commutators causes sparking, deteriorates mica, and mixes with dust to form a harmful mess which may cause a burnout if accumulated in sufficient quantity. Sleeve bearings should have oil changed every six months while roller and ball bearings ought to have grease renewed every year.

Before oil is changed, the old oil should be drained and the bearings flushed out. Only high grade lubricants should be used. Standard guns are used for greasing grease bearings. When all the old grease has been removed, the new lubricant should be injected with the vent open, taking care to add only the required amount at low pressure on the gun.

When a motor is taken out of service for its annual overhaul and inspection it should be cleaned first. It is good practice to apply a coat of good insulation varnish at this time. If chemicals are being carried in the surrounding atmosphere, it is recommended that varnishes resistant to

A Line Cure is no better than its Connections

K & H
Hot Line Clamps
For Copper and Aluminum Lines
Made in Two Parts

Catalog Nos. 4545C and 4565A

Line Unit—The part that connects permanently to the line.

Connector Unit—The part to which tap wire is attached.

These clamps are designed to overcome three objectionable features encountered in making hot line connections in the past, viz:

1—To eliminate arcing or crushing of line while connecting or disconnecting tap wire.

2—To prevent atmospheric corrosion rendering threads useless.

3—To forestall mechanical failure caused by ice and sleet.

HOT LINE STICK ADAPTER
Quickly and easily attached to any Standard Hot Line Stick.
Catalog No. HLA2

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Solderless Terminal Lugs and Connectors
VINE AT THIRD-ES • CINCINNATI, OHIO

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Manning 300 All Rag Paper available from stock in sheets 24" x 36" in thicknesses .007", .010", .015", .020", .025", 1/32", and 1/16". Also furnished in strips and rolls. For more complete information, see page 6 of the IWI Blue Catalog.

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Lloyd's start quicker — work better — last longer. Specified repeatedly as the standard of quality and performance.

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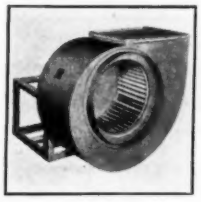

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Double Inlet and Single Inlet

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★ **CENTER DISC WHEEL**—Double Inlet, Double Width • Reinforced Center Disc • Designed for Modern Air Conditioning and Heating Applications • Sizes, 4½" to 50".

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SCHWITZER-CUMMINS COMPANY
1145 EAST 22ND STREET INDIANAPOLIS, U. S. A.

chemical action be used. When bearings are renewed, motors moved for belt renewal, or pulleys changed, the machine should be checked for alignment before it is returned to service.

Brushes should be removed and wherever more than 50 per cent wear is found renewal should be made. Rough surfaces on slip rings and commutators are smoothed by running the machine at low speed and stoning with an approved stone; wooden blocks, faced with sandpaper, will serve for smoothing surfaces, but where the scoring is heavy a stone ought to be used.

It is not necessary to remove commutators for stoning, but where severe cutting has been done the entire commutator should be removed and turned down. After any stoning or turning down, the mica should be checked for undercutting; rather than have level mica it is better to keep an undercut of about one-thirty-second of an inch. High bars should be driven in place before stoning and undercutting.

Control Maintenance

Control equipment should be considered as important as the apparatus it serves, and regular maintenance is required to keep it functioning. As with motors, dirt is one of the chief enemies of controls. Adequate covers must be provided for contactor compartments and starting boxes.

Arcing of contacts may result from many defects: loose connections, weak springs, rough surfaces, bent arms, and loose bolts are often causes of trouble. When arcing occurs, an oxide is formed which must be removed. An ordinary file may be used for cleaning contact surfaces. If the service is severe and contact faces of circuit breakers become worn rapidly, facings of silver will extend the life considerably.

Resistors are subject to failure due to breakdown of joints, scaling resulting from overheating, and corrosion due to chemical fumes; vibrations carried from surrounding structures may cause failure. Joints should be examined for cracks and renewal by brazing or silver soldering ought to be done at overhaul periods.

Bases of control equipment, relays, grids, and circuit breakers must be protected from corrosion and annual painting will preserve the metal. In all control equipment, it is necessary to provide freedom of movement so that the functions will be performed as intended.

Care of Idle Equipment

It often becomes necessary to store or otherwise take care of idle electrical equipment. The first requisite for care of idle apparatus is to keep it covered and protected from the elements, dirt, dampness, and other deteriorating influences. Belts should be removed from motors and stored for protection. Fuses should be removed and switches should be kept in the open position. Waterproof coverings ought to be provided for the idle apparatus. In the case of motors, it is advisable to supply heat to enclosed machines; coverings should be vented so that vapor resulting from the heat may pass off. In no case should the apparatus be returned to service until cleaned and inspected.

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from a small stock of these good looking, good-cooking units. Proven in thousands of kitchens. Enduring, economical, easily cleaned. Built to Chromalox standards to maintain the Chromalox reputation. Write for details.

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EDWIN L. WIEGAND COMPANY, 7600 THOMAS BLVD., PITTSBURGH, PA.

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MEGOHMER

No more tiresome cranking of a hand-driven generator.

This entirely self-contained instrument operates with a steady test potential of 500 volts DC, available at the touch of a switch. Direct readings in insulation resistance.

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DISTRIBUTED IN THE SOUTH BY LEADING JOBBERS
as Westinghouse Electric Supply Co.
Graybar Electric Co.
General Electric Supply Co.

Determining Motor Loads from Amperes

(Continued from page 13)

rents, in the order of 45 per cent of full-load current for 600-rpm motors.

It may be surprising to find that the no-load currents are as high as that shown in Fig. 1, but it should be remembered that the no-load current is nearly all magnetizing current at practically zero lagging power factor and that the actual horsepower input from the power system is very low. This accounts for the rather high currents below one-half load where the efficiency of the motor is also lower.

From one-half to full load, it can be seen that the motor current is roughly proportional to horsepower output because both efficiency and power factor are higher and more nearly constant. Above full load, the current continues to increase in direct proportion to the load up to 125 per cent of full load. This can be useful as a guide in carrying out wartime recommendations on increased motor loadings.

High Degree of Accuracy

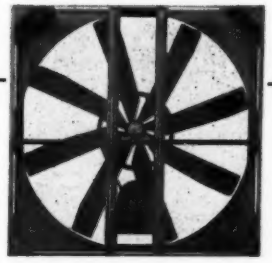
Thus we have a timely, practical, and time-saving way to determine the horsepower that an a-c motor is delivering just from an ammeter reading. Accuracy of between 2 and 3 per cent can be expected, subject, of course, to the ammeter accuracy tolerance.

Another advantage to be obtained by the hook-on volt-ammeter is that the voltage applied to the motor can be read simultaneously with the current. It is obvious that a motor must have the proper voltage applied or the current will be too high and overheating will result. This will also give an indication of the loads on feeder copper so that remedies can be applied.

It is hoped that this method will serve as an additional tool to help in the war program of utilizing all materials to the best advantage. Proper motoring is a patriotic necessity to conserve vital materials. Overmotoring is a tacit admission of insufficient knowledge of the machine and during wartime it is almost a crime. We should err on the side of reasonable overloading to get maximum use of the motor horsepower available to produce victory.

A "Blow" for Victory

that may "blow" profits your way



Coolair
TRADE MARK

COOLAIR EXHAUST FANS AND BLOWERS are dedicated to war work these days, functioning as efficiently for victory as they formerly did for business and industry.

But the fact that Coolair production is restricted entirely to the requirements of Army and Navy establishments and war-goods plants with high priority ratings, does not limit your opportunity for profit.

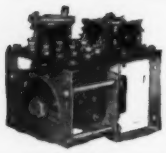
On the contrary, in war production areas, it gives the COOLAIR dealer an excellent opportunity to sell COOLAIR exhaust fans and blowers profitably to such establishments. If you are in one of these areas, make the most of your favorable situation with Coolair.

In addition, wherever you are, you should be creating future profits now by laying the groundwork for post-war sales of Coolair equipment. Make prospect files! Talk Coolair to prospects! Arouse a customer desire for Coolair equipment for homes, offices, restaurants, business establishments, hotels and industrial plants.

Our long-established policy of prompt service and close cooperation with our dealers remains unchanged. We invite inquiries about dealerships.

A full description of the Coolair line, with tables showing models, dimensions, performance data, etc., can be found in
SWEET'S CATALOG A.S.H.V.E. GUIDE
and the new issue of
ELECTRICAL BUYERS REFERENCE

AMERICAN COOLAIR CORPORATION
3604 Mayflower Street Jacksonville, Florida



IT'S IN THE NAVY, NOW

This motor driven, time delay relay has been used for years as a time control in drying systems, heat treating ovens and illumination.

Now it's in the Navy. The positive action, ruggedness and resistance to shock and vibration of this relay, make it ideal for alarm control, communication circuits and for the protection and timing of many kinds of equipment aboard ship. Manufacturers can often find items in the regular line of Ward Leonard Controls that will serve their needs.

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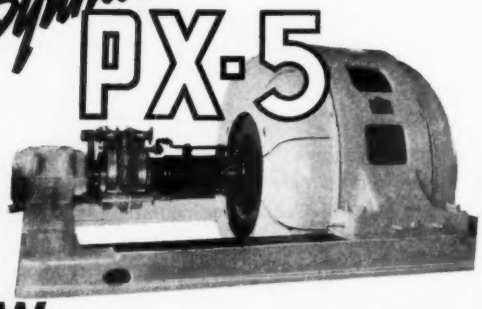

NEW BLACK POLYMERIZING VARNISH

Curing by heat through chemical polymerization, this varnish will dry hard even in the deepest interstices of large coils. Then too, shorter baking will permit flexibility, yet cure the varnish evenly throughout. SYNTHITE PX-5 Black Baking Varnish possesses the essential bonding properties which will hold windings intact under the centrifugal force produced by high speed motors. It is ideally suited for use on the modern types of enamelled magnet wire and Class B insulation. This material affords maximum resistance to acids and can withstand high temperatures. Write for specifications.

Dolphs

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166 Emmet Street, Newark, New Jersey

ADVERTISER'S INDEX

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